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THE

INDUSTRIAL PRIMARY ARITHMETIC.

BY

JAMES BALDWIN, PH.D.



BOSTON, U.S.A. :

PUBLISHED BY GINN & COMPANY.

1891.

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## THE PLAN OF THIS WORK.

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THIS book is distinguished from other Primary Arithmetics in the following particulars :

1. It is an illustration of the *natural* method of teaching numbers.
2. It presents the work in such a manner that the pupil is constantly *led to make discoveries for himself*.
3. It is entirely *practical*. The pupil is still too young to understand the *science* of Arithmetic. The course of instruction presented in this book is intended only to prepare for and lead up to the study of the science.
4. The instruction to be imparted by the teacher is clearly indicated in the left-hand column of each page ; while the "seat work" of the pupil is given in the other column.
5. It is believed that pupils who complete this book, elementary as it is, will be prepared to perform nearly all the mathematical calculations in small numbers usually required of persons in the ordinary vocations of life. Better, however, than the direct knowledge which is obtained from these lessons, is the acquisition, through them, of an ability and a desire to make further discoveries in the practical use of numbers. Hence, if necessity arise, pupils will, in the end, be able to perform operations much more difficult than any here presented.
6. The work of these lessons is supposed to extend through the first three or four years of school life. Any treatise — not too primary — on the science of Arithmetic may then be taken up and studied with such added understanding that it may be completed in much shorter time than that usually devoted to it.

## TO THE TEACHER.

---

By all means in your power, encourage the pupil to find out things for himself,—to carry on original investigations.

Do not check or discourage the pupil's efforts to do, simply because he does not pursue *your methods*. Correct his errors kindly, give him every needed help, and encourage him to press forward in the path of discovery.

Let every exercise, every question, and every problem be business-like and practical. Keep clear of puzzles. Shun rules and (to the child) meaningless forms and "processes."

*Do not waste time in pretending to teach that which you know the pupils already understand.*

On the other hand, do not hasten to a new subject or lesson until those which precede it are reasonably well mastered.

LET EVERY LESSON BE A VOYAGE OF DISCOVERY.

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EXPLANATORY NOTE.—The teacher's work, including the oral instruction to be given in the recitation hour, is indicated on the left-hand side of the page. Explicit directions to teachers are printed in italics. What the teacher may say to pupils, and also many things which the pupils may learn directly from the book, are printed in ordinary type. The work of the pupils at their seats is indicated on the right-hand side of the page. Their work during the recitation hour corresponds to the oral instruction and class exercises indicated on the left-hand side.



THE INDUSTRIAL ARITHMETIC.



*STEP THE FIRST.*

TWO TO FIVE.



## STEP THE FIRST.



### THINGS NEEDED.

1. A variety of common objects to be used as counters, such as *buttons, pebbles, nails, acorns, shoe-pegs, grains of corn.*

2. Sticks (about the size of matches), one inch, two inches, three inches, and four inches long. A hundred of each length will not be too many.

3. Rulers one foot long, with no marks on them. Have as many of these as there are pupils in the class.

4. Pieces of pasteboard one-half inch wide and one inch long.

5. A yard-stick without any divisions, either of feet or of inches, marked on it.

6. Cord strings of different lengths. Strips of paper, and narrow ribbons from one inch to four yards in length.

7. Squares of pasteboard, cut carefully, some one inch square and some two inches square.

8. Cubical blocks, one inch, one-half inch, and one-fourth inch on each edge; also rectangular prisms one inch long and one-half inch square.

9. Liquid measures, — pint, quart, and gallon.

10. Every child should have a slate and pencil, and should be allowed the use of such articles as are needed for the illustration of any lesson.

## THE NUMBER TWO.

WE begin with the number Two, because the number One, considered alone, admits of no combinations. Every child of intelligence knows all about One that it is necessary for him to know at this stage.

## CLASS WORK.

*Talk about things of which the pupils can see two of a kind,—as two hands, two boys, etc.*

*Let the pupils name objects of which they see two of a kind.*

EXAMPLES: "I see two boys; I have two feet; here are two sticks."

"How many sticks have I here?" ("One.")

"How many in my other hand?" ("One.")

"Now how many?" [Putting them together.] ("Two.")

"Then one stick and one stick are how many?"

"One and one are how many?"

*Illustrate in the same way with balls, pencils, nails, and other objects.*

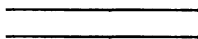
"I strike the bell once; I strike it once again. How many times did I strike it?"

## SEAT WORK.

Make two lines on your slates, thus :



Make two lines, thus :



Make two dots, • •

Make two rings, ○ ○

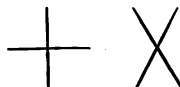
Make two stars, \* \*

Put two dots together like these ••, or these ••, or these ••.

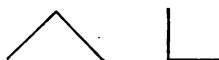
Put two stars together in the same way.

Put two rings together in the same way.

Make two lines cross each other, thus :



Make two lines meet each other, thus :



## CLASS WORK.

Here is one boy standing at my desk ; and there is one boy sitting in a chair.

One boy and one boy are how many boys ?

*Illustrate variously.*

*Show the pupils how to make a good figure 2.*

Write the figures 1 and 2 on the blackboard.

How many are one and one ?  
(One and one are two.)

Write what you have told me.

*One and one are two.*

Write it this way also :

*1 and 1 are 2.*

*Write the sentence on the blackboard, and let the pupils copy it.*

Let me see what you have written.

Now I will show you a shorter way to write the same thing :

$$1 + 1 = 2.$$

*After the pupils have seen the above, erase it, and write again :*

One and one are two.

Now each of you may write this on the blackboard in the shorter way.

## SEAT WORK.

1. Write the figure 1.

2. Write this figure :

2

3. Write its name.

4. Write two rows of 2's on your slate, thus :

2 2 2 2 2 2  
2 2 2 2 2 2

5. Write a row of 1's and a row of 2's, thus :

1 1 1 1 1 1 1 1 1 1 1  
2 2 2 2 2 2 2 2 2 2 2

6. Copy this on your slates :

*One and One are Two*

7. Write the same thing in a shorter way.

$$1 + 1 = 2.$$

8. Write this :

$$1 + 1 = 2$$

one and one are two.

9. Copy the following, and write the right figure and word after the sign = :

$$1 \text{ boy} + 1 \text{ boy} =$$

$$1 \text{ dog} + 1 \text{ dog} =$$

$$1 \text{ girl} + 1 \text{ girl} =$$

## CLASS WORK.

*Write this on the blackboard, and let the pupils read it:*

$$1 + 1 = 2.$$

This mark or sign + means and.

This mark or sign = means are or is.

Come to the blackboard, one at a time, and write the sign +.

Who has written it best?

*In the same way let the pupils write the sign =.*

Write what is meant by +.

Write what is meant by =.

Write, using signs:

1 book and 1 book are 2 books.

1 girl and 1 girl are 2 girls.

*Let the pupils make the signs with sticks, or with pieces of paper.*

*Illustrate  $1 + 1 = 2$  in every possible manner, using objects, as balls, blocks, sticks, etc.*

*Illustrate the same with larger objects which the pupils can see, as desks, trees, houses, boys.*

*But as soon as all the pupils seem to understand these processes reasonably well, proceed without delay to a new lesson.*

## SEAT WORK.

Copy these lines on your slates:

$$1 + 1 = 2. \quad X + X = X X$$

$$\bigcirc + \bigcirc = \bigcirc \bigcirc \quad \square + \square = \square \square$$

$$* + * = * *$$

Copy these lines on your slates, and fill each vacant place with the proper figure, sign, or picture.

$$1 + 1 = . \quad 1 + = 2.$$

$$\bigcirc + \bigcirc = . \quad + * = * *$$

$$X + X = . \quad \square + = \square \square$$

$$\square + \square = . \quad + X = X X$$

$$* + * = . \quad + 1 = 2.$$

$$1 \text{ box} + 1 \text{ box} = 2 \text{ boxes.}$$

$$1 \text{ tree} + 1 \text{ tree} = 2 \text{ trees.}$$

Copy these lines, and fill the vacant places:

*One block and one block are blocks.*

*One nail and one nail are*

*One stick and stick are two sticks.*

## CLASS WORK.

I had one marble, and John gave me one more; how many marbles had I then?

(Answer: Two marbles; because one and one are two.)

Write your answer thus:

$$1 + 1 = 2.$$

Read this answer as you have it written.

*Make up a great variety of questions similar to the above.*

*Now let the pupils ask each other questions:*

(John): I have here one block in my hand, and I take another; how many do I have?

(Mary): I make one mark on this side of my slate, and one on the other side; how many marks have I made?

(Frank): I have one thumb on my right hand, and one on my left hand; how many thumbs have I on both hands?

*N.B. Let the action always accompany the word.*

*Continue work of this kind until the pupils thoroughly understand all that is to be learned about  $1 + 1 = 2$ .*

## SEAT WORK.

1. Copy this:

1 2 1 2 1 2 1 2 1

2 1 2 1 2 1 2 1 2

2. Copy this:

1 2 2 22

2 1 2 22

1 2 2 22

2 1 2 22

1 2 2 22

2 1 2 22

1 2 2 22

2 1 2 22

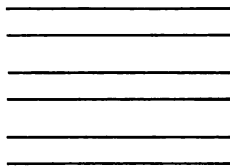
3. Copy this:

+ + = + + = = +

= + + = + + = =

+ = + + = + + =

4. Copy this, making the lines just as long and just as far apart as these:



5. Draw two lines meeting each other in a sharp point.

6. Draw two lines crossing each other.

7. Copy:  $1 + 1 = 2$ .

## CLASS WORK.

How many sticks have I in my hand?

(Ans. Two.)

I take one of the sticks away; how many are left?

Then 2 sticks less 1 stick is how many sticks?

*Illustrate with other objects, making clear the meaning of the word less as here used.*

*Teach how to write*

$$2 - 1 = 1.$$

1. Here are 2 marbles; I give one to Mary. How many have I now?

(Ans. One marble, because 2 less 1 is 1.)

2. Mary has one marble and I have one marble. How many marbles have both?

3. I make two marks on the board. I rub one of them out; how many remain?

4. Here are two girls standing at my desk. One goes away; how many remain?

Two girls are how many more than 1 girl?

*Make up a great variety of similar questions.*

## SEAT WORK.

Write:  $2 - 1 = 1.$

$$1 + 1 = 2.$$

Copy, and fill up the blank places:

$$2 - 1 =$$

$$1 + 1 =$$

$$2 - = 1.$$

$$1 + = 2.$$

$$- 1 = 1.$$

$$+ 1 = 2.$$

Copy: \_\_\_\_\_

Copy: \_\_\_\_\_

*One. Two. One.*

Copy:

1 1 1 1 2 2 2 2

Copy:  $1 + 1 = 2.$

$$2 - 1 = 1.$$

Copy: 1 2 1

2 2 1

1 2 2

2 2 2

1 2 1

2 2 1

1 2 2

2 2 2



## CLASS WORK.

I hold in my hand a stick one inch long. Each one of you may take a stick that is just as long.

We say that anything is an inch long if it is just the length of this stick.

Make a mark on your slates one inch long.

Measure the mark by laying the stick by the side of it.

Is the mark too long, or too short?

Try again.

*Explain the inch mark on the margin of this page.*

Make two dots just one inch apart.

From this box, containing a number of sticks, pick out one that is just an inch long.

Here are some strips of paper of different widths; pick out one that is just one inch wide.

Hold your hand just one inch above the desk.

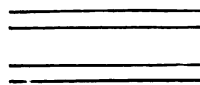
Now find other objects that are about one inch long.

Make two lines about an inch apart and an inch long.

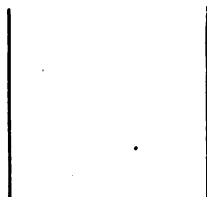
## SEAT WORK.

These lines are one inch long.

Draw lines exactly the same length on your slates.



1 inch.



The last two lines are an inch apart.

Draw lines on your slates that are just an inch apart.

Measure all the lines that you have drawn, and see if your work is correct.

Copy :

*One inch.*

*One inch.*

*1 inch.*

*1 inch.*

*One inch = 1 inch.*

*Two inches = 2 inches.*

## CLASS WORK.

Take 2 sticks, each one inch long.

Lay them side by side, thus :



Now put them together, end to end, thus :



How long are both sticks taken together ?

1 inch + 1 inch = 2 inches.

Now find a stick that is as long as these two sticks taken together.

Hold it up so that I can see it. How long is it ?

Make a line on your slates two inches long.

Measure the line, and see whether it is too long or too short.

*Children may measure first with the 2-inch stick.*

*Show them how to measure.*

Find a block that is two inches wide.

Cut a piece of paper two inches wide.

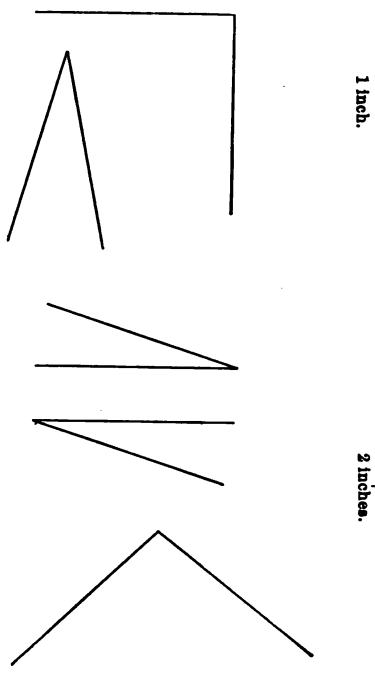
Find a board that is two inches thick.

Measure all these objects.

## SEAT WORK.

Put your two sticks in as many different positions, touching each other, as you can.

Draw lines like the following, being always careful to make each line exactly an inch long.



Copy :

*One inch. One inch.*  


---

*Two inches.*

## CLASS WORK.

*Practice with "one inch" and "two inches" until each child can readily recognize them.*

*Let the pupils find things about the schoolroom which are about an inch long, or about two inches long.*

*Let them measure with the small sticks.*

*If they should happen to measure objects much longer than two inches, no harm will be done.*

Which lines on the right-hand side of this page are just 1 inch long? Which are just 2 inches long? Which less than 1 inch long? Which more than 1 inch long and less than 2 inches long? Which more than 2 inches long?

*Let the pupils cut pieces of paper just 1 inch long, and other pieces just 2 inches long.*

*Let them cut pieces 1 inch wide; 2 inches wide.*

Find a block 1 inch thick.

Find something that is 2 inches thick.

Cut a piece of paper so that it is 1 inch long and 1 inch wide.

## SEAT WORK.

1. Copy :

$$1 + 1 = 2.$$

$$1 \text{ inch} + 1 \text{ inch} = 2 \text{ inches.}$$

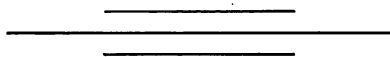
$$2 - 1 = 1.$$

2. Copy, and fill blanks :

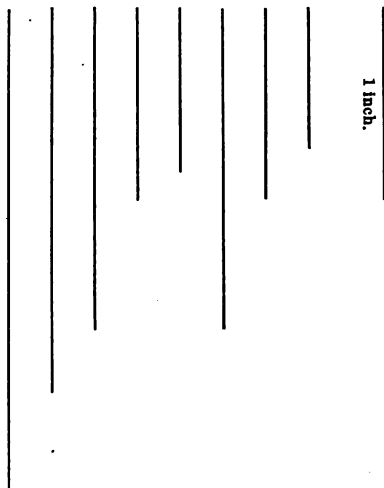
$$1 \text{ boy} + 1 \text{ boy} = \text{boys.}$$

$$1 \text{ inch} + \quad = 2 \text{ inches.}$$

3. Measure these lines :



4. Measure these lines :



5. Draw other lines like these, and measure them.

6. Write these words :

*inch, inches.*

## CLASS WORK.

*Give a variety of exercises with the 1-inch sticks; also with the 2-inch sticks.*

*Review what has already been learned about*

$$1 + 1 = 2.$$

$$2 - 1 = 1.$$

Here is a line one inch long.  
If I make it one inch longer,  
how long will it be then?

Here is a line two inches long.  
If I take away one inch of its  
length, how long will it be  
then?

*Use also objects, as sticks,  
cords, and strips of paper. After  
pupils are thoroughly familiar  
with the inch, proceed to talk  
about the foot.*

I hold in my hand a ruler  
which is one foot long.

You may each take a ruler  
which is one foot long.

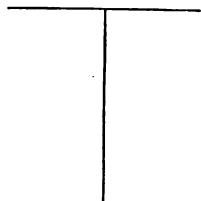
Each may make a line on the  
blackboard just one foot long.

Measure your lines and see  
which is the nearest right.

Now make a line that is two  
feet long.

## SEAT WORK.

Draw two lines each 1  
long, meeting each other,



Copy:

*One inch.*

*Two inches.*

*One foot.*

*Two feet.*

*One inch + 1  
inch = two inc.*

*One foot + 1  
foot = two feet*

*1 inch + 1 inch  
2 inches.*

*2 inches =  
1 inch + 1 inch.*

## CLASS WORK.

Find some things in the room which are about one foot long.

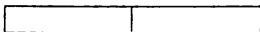
You may each cut a string just one foot long, measuring it with the ruler.

*Give each pupil a narrow strip of pasteboard a foot long.*

*Let each find for himself how long the pasteboard is.*

*Give to each another strip of the same length.*

Place these two strips of pasteboard together, end to end, thus :



How long are the two strips taken together ?

Measure with the foot ruler.

Write it thus :

$1 \text{ foot} + 1 \text{ foot} = 2 \text{ feet}.$

Make a line on the black-board two feet long.

*Continue such exercises for two or three days.*

Make a straight mark across your foot ruler just one inch from one end. Make another such mark just two inches from the same end.

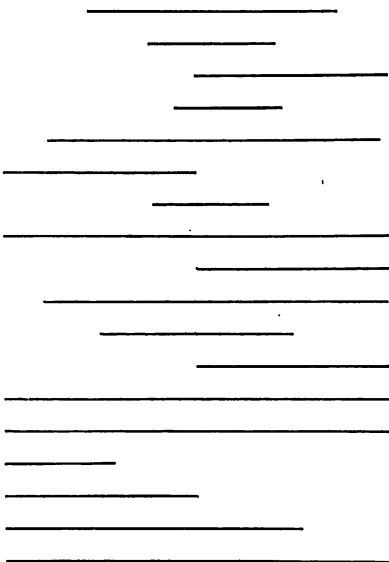
## SEAT WORK.

1. Copy :

$1 \text{ inch} + 1 \text{ inch} = 2 \text{ inches}.$

$1 \text{ foot} + 1 \text{ foot} = 2 \text{ feet}.$

2. Measure these lines :



3. Which of the above lines are exactly 1 inch long ?

4. Which are exactly two inches long ?

5. Cut a piece of paper 1 inch long.

6. Cut a piece of paper 1 inch wide.

7. Cut a piece of paper 1 foot long.

## CLASS WORK.

Make a line on your slates two inches long.

Rub out one inch of this line. How long is the part that remains?

Write it thus:

2 inches — 1 inch = 1 inch.

Make a line on the black-board 2 feet long.

Rub out 1 foot of that line. How long is the part that remains?

Two books are how many more than one book?

Two inches are how much more than one inch?

A line 2 inches long is how much longer than a line one inch long?

A line 2 feet long is how much longer than a line one foot long?

*Let the pupils find objects 2 inches long; also objects 2 feet long.*

*Review all the points included in the preceding oral lessons.*

*NOTE. It is presumed that every pupil is now able to count ten objects of any kind.*

## SEAT WORK.

Copy:

$$1 + 1 = 2$$

$$2 - 1 = 1$$

$$1 \text{ boy} + 1 \text{ boy} =$$

2 boys.

$$2 \text{ boys} - 1 \text{ boy} =$$

1 boy.

One. Two.

1 1 1 1 1 2 2 2 2 2

inch. inches.

foot. feet.

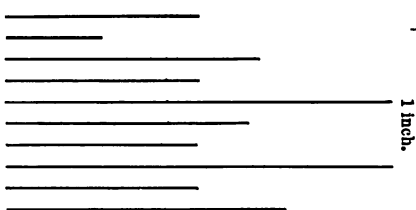
$$1 \text{ inch} + 1 \text{ inch} = 2 \text{ inches.}$$

$$1 \text{ foot} + 1 \text{ foot} =$$

$$2 \text{ inches} - 1 \text{ inch} =$$

$$2 \text{ feet} - 1 \text{ foot} =$$

Measure these lines:



How many are just one inch long?

## THE NUMBER THREE.

## CLASS WORK.

*Let the pupils name three things in the room.*

*Let them clap their hands, counting at the same time, "One, Two, Three."*

*Let three pupils stand.*

*Let each pupil hold up three fingers.*

*Make three marks on your slates. Make three stars.*

*Lay three sticks side by side on your desks.*

*Draw three lines on the blackboard.*

*Show the children how to make the figure 3.*

*Require them to take great care in making this figure.*

*See that the exercises indicated in the next column are properly and neatly performed.*

*Let each pupil make 3 marks quickly.*

*Let each take 3 blocks from a number of blocks.*

*Let each select quickly 3 objects of any given kind.*

*Continue and vary these exercises, using different objects.*

## SEAT WORK.

Draw one line on your slates one inch long :

\_\_\_\_\_

Draw two lines, each one inch long :

=====

Draw three lines, each one inch long :

=====

Draw one line three inches long.

Copy :

*One, Two, Three.*

*one, two, three.*

*1                  2                  3*

—••—

Make three lines of 3's, thus :

3 3 3                  3 3 3

3 3 3                  3 3 3

3 3 3                  3 3 3

Make two lines of 2's, thus :

2 2                  2 2

2 2                  2 2

1 inch.

1 inch.

1 inch.

## CLASS WORK.

1 and 1 and 1 are how many ?

*Illustrate with objects.*

2 and 1 are how many ?

1 and 2 are how many ?

*Illustrate each of the above with objects.*

*Make up a variety of questions to illustrate each.*

*Let the pupils ask each other questions.*

Mary had 2 apples, and Frank gave her one more. How many apples had she then ?

John, James, and Jacob each have a book. How many books have all together ?

Henry puts one block on the table, and Anna puts two blocks there. How many blocks are now on the table ?

Anna has 2 cents. How much does she lack of having 3 cents ?

*Compare 3 with 1.*

*Compare 3 with 2.*

Three boys are how many more than 1 boy ?

Charles has 1 book, and John has 3 books. How many more books has John than Charles ?

Draw a line 3 inches long.

## SEAT WORK.

1. Copy :

$$1 + 1 + 1 = 3.$$

$$2 + 1 = 3.$$

$$1 + 2 = 3.$$

2. Copy, and fill the blanks :

$$1 + 1 + 1 =$$

$$1 + 1 =$$

$$2 + 1 =$$

$$+ 2 = 3.$$

$$2 - 1 =$$

$$1 + \quad + 1 = 3.$$

$$2 + \quad = 3.$$

3. Write :

*Three. Triangle.*  
*Inch. Foot.*

4. Draw three lines each 1 inch long.

5. Draw three lines each 2 inches long.

6. Draw three lines each 3 inches long.

7. Make three dots each 1 inch from the others.

8. Draw straight lines so as to join these dots.

9. Make a mark on your foot ruler just three inches from one end.

3 inches.



CLASS WORK.

Three is how many more than two?

Three is how many more than one?

*Illustrate with objects, marks, etc.*

\* \* \* \* \*

Here are three stars on my right and two stars on my left; how many more stars on my right than on my left?

Here are three girls and two boys by my desk; how many more boys are there than girls?

Mary has three apples, Anna has one; how many more has Mary than Anna?

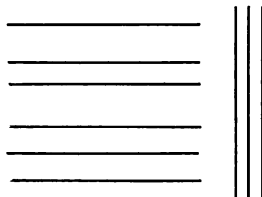
Here is a line one inch long; how much longer must I make it in order that it shall be three inches long?

This stick is three inches long, and this stick is two inches long. If I cut off a part of the longer stick so as to make it the length of the shorter, how long is the part cut off?

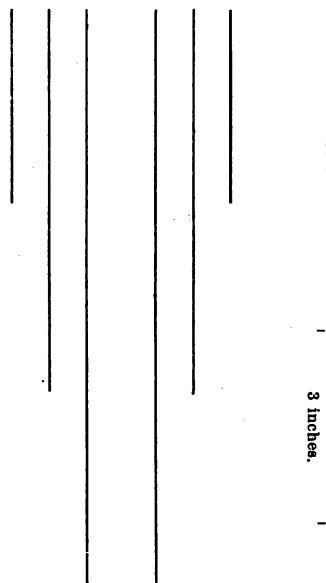
*Continue such illustrations until the excess of 3 over 2, and of 3 over 1, is understood.*

SEAT WORK.

Draw lines like these, and of the same length, on your slates:



Measure these lines:



Draw other lines like the above, and of the same length.

## CLASS WORK.

*Explain the work indicated in the opposite column, and see that it is properly done.*

We call a figure like this, which has three sides and three corners, a **Triangle**.

Each one of you may draw a triangle on the blackboard.

What is a triangle?

Point to its 3 corners.

Point to its 3 sides.

Name some things that you have seen, in the schoolroom or out of it, which are of the shape of a triangle.

*Let the pupils cut triangles from pieces of paper.*

*Let them draw triangles of different sizes on the blackboard.*

*Let them make triangles with sticks, and with rulers.*

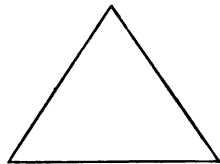
We call each of the three corners inside of a triangle an **Angle**.

If the three sides of a triangle are equal, you will notice that the angles are also equal.

Draw a triangle, making one side much longer than either of the other sides.

## SEAT WORK.

1. Take 3 sticks, each an inch long, and place them together, thus:

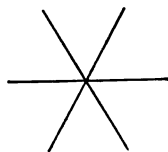


TRIANGLE

2. Draw three lines in the same way.
3. Write this word:

*Triangle.*  
*triangle.*

4. Make three triangles on your slates.
5. Make three triangles with sticks.
6. Make a triangle having the sides of different lengths.
7. Draw three lines crossing each other, thus:



3 inches.

8. Measure these lines, and be sure that all are the same length.

## CLASS WORK.

Make three marks on your slates. Rub out one of them; how many remain?

Here are three balls. I give one of them away; how many remain?

Write on your slates, Three less one are two, thus:

$$3 - 1 = 2.$$

*Illustrate in various ways.*

*Teach in similar manner that*

$$3 - 2 = 1.$$

John has 3 books. After giving 1 to Mary and 1 to May, how many has he left?

$$3 - 1 - 1 = 1.$$

George lost 2 marbles. He has 1 marble left. How many had he at first?

Three boys are in the room. If two go out, how many remain?

*Ask many questions similar to those above. Let the pupils ask each other questions.*

*Continue exercises in measuring. Have pupils draw lines 1 inch, 2 inches, 3 inches long. Also lines 1 foot long, etc.*

## SEAT WORK.

Copy, and fill the blank spaces correctly:

$$3 - 1 =$$

$$3 - \quad = 1.$$

$$2 + 1 =$$

$$\quad - 2 = 1.$$

$$\quad - 1 = 2.$$

$$\quad - 1 = 1.$$

$$1 + \quad = 3.$$

$$1 + 1 + 1 =$$

$$2 + 1 - 1 =$$

$$3 - 1 - 1 =$$

$$3 - 2 =$$

$$2 + 1 =$$

$$1 + 1 =$$

$$1 + 2 =$$

$$3 \text{ balls} - 1 \text{ ball} = \text{balls.}$$

$$3 \text{ marks} - \text{mark} = 2 \text{ marks.}$$

$$3 \text{ books} - 1 \text{ book} - 1 \text{ book} \\ = \text{book.}$$

$$2 \text{ balls} + 1 \text{ ball} = \text{balls.}$$

$$2 \text{ marks} + \text{mark} = 3 \text{ marks.}$$

$$1 \text{ book} + 1 \text{ book} + 1 \text{ book} \\ = \text{books.}$$

$$1 \text{ inch} + 2 \text{ inches} = \text{inches.}$$

$$1 \text{ foot} + 2 \text{ feet} = \text{feet.}$$

$$3 \text{ feet} - 1 \text{ foot} = \text{feet.}$$

$$3 \text{ feet} - 2 \text{ feet} =$$

3 inches.

## CLASS WORK.

1. A man had 3 sheep. A dog killed one of them; how many were left?

2. Tom had three cents, but having spent some of his money, he has now only 1 cent. How much did he spend?

3. A boy loses two marbles, and still has 1 marble left. How many had he at first?

4. Mary had 1 card. I gave her some more, and now she has 3 cards. How many did I give her?

5. Here are three boys. If each gives me 1 block, how many blocks will I have?

6. Alice had two apples, and Jane gives her 1 more; how many has she now?

7. After she has eaten 2 of her apples, how many will be left?

8. Here are three boys, each having one book in his hand. How many books do all have? Three times one book are how many books?

*Let the pupils make up other questions similar to the above.*

## SEAT WORK.

Memorize the following thoroughly:

$$1 + 1 = 2.$$

$$2 + 1 = 3.$$

$$1 + 2 = 3.$$

$$3 - 1 = 2.$$

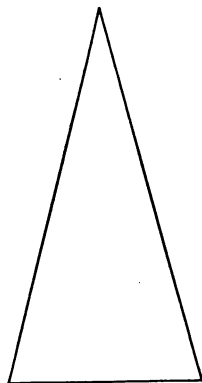
$$3 - 2 = 1.$$

$$2 - 1 = 1.$$

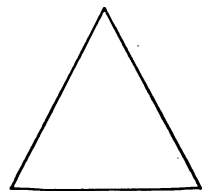
Copy:

*One, Two, Three.*

Copy:



TRIANGLE



TRIANGLE.

Measure the sides of these triangles.

## CLASS WORK.

I make 1 mark, thus :

---

Now I make 1 mark again :

---

How many times did I make one mark ?

How many marks did I make ?

Two times 1 mark are how many marks ?

Write  $1 + 1 = 2$ .

How many times did you write 1 ?

We say 2 times 1 are 2.

Write  $1 + 1 + 1 = 3$ .

How many times did you write 1 ?

We say 3 times 1 are 3.

I will show you a shorter way to write 3 times 1 are 3, thus :

$$3 \times 1 = 3.$$

We may write 2 times 1 are 2 in the same way, thus :

$$2 \times 1 = 2.$$

This mark  $\times$  means *times*.

Take three sticks, each 1 inch long. Three times 1 inch are how many inches ?

---



---



---

## SEAT WORK.

1. Copy :  $\times =$  times.

$$2 \times 1 = 2.$$

$$3 \times 1 = 3.$$

$$1 \times 2 = 2.$$

$$1 \times 3 = 3.$$

*signs.*

*signs.*

$+$   $\times$   $=$

*inch.*

*inches.*

*foot.*

*feet.*

$$\text{one foot} = 1 \text{ ft.}$$

$$\text{one inch} = 1 \text{ in.}$$

$$\text{two feet} = 2 \text{ ft.}$$

$$\text{two inches} = 2 \text{ in.}$$

$$\text{three feet} = 3 \text{ ft.}$$

$$\text{three inches} = 3 \text{ in.}$$

2. Draw three lines, each 1 in. long.

3. Draw three lines, each 2 in. long.

4. Draw three lines, each 3 in. long.

5. Copy this, and fill the blanks :

$$2 + 1 =$$

$$2 \times 1 =$$

$$2 - 1 =$$

## CLASS WORK.

John may make a line on the blackboard 1 foot long.

Mary may make a line twice as long.

2 times 1 ft. = what?

Frank may make a line 3 times as long as John's.

3 times 1 ft. = what?

How long is the line that Frank has made?

We say that 3 feet are 1 yard; so instead of saying that Frank's line is 3 feet long, we may say that it is 1 yard long.

Here is something for you to remember :

**Three feet are one yard.**

Each of you may draw on the blackboard a line 1 foot long.

Each may draw a line 1 *yard* long.

Here is a stick which we call a *yard-stick*. It is 3 ft., or 1 yd., long.

How much longer is it than a ruler 1 foot long?

Measure 3 feet with a ruler (on floor or blackboard).

Measure 3 feet with a yard-stick.

## SEAT WORK.

1. Three feet are 1 yard.

3 ft. = 1 yd.

2. Cut a string just 3 feet long.

3. Cut another string just 1 foot long. Cut another 2 feet long:

4. Copy :

*inch. foot. yard.*  
*inches. feet. yards.*  
*Three feet in one*  
*yard.*

5. Measure these lines.

6. Draw a line twice as long as the shortest one.

7. Draw a line twice as long as the middle one.

8. Draw a line half as long as the longest one.

9. Draw a line as long as the two shorter lines put together.

*NOTE. The teacher will see that you have drawn these lines accurately.*

10. Mark the number of inches in each line.

## PIECES OF MONEY.

## CLASS WORK.

1. I had 3 cents, and gave 2 of them to Mary; how many had I left?

2. If 1 foot of ribbon costs 1 cent, what will 2 feet cost?

3. Tom bought 2 marbles for a cent apiece, and gave the storekeeper a 3-cent piece; how much change ought the storekeeper to give him?

4. How many 1-cent pieces are worth as much as a 3-cent piece?

5. What two pieces of money are together worth 3 cents?

6. Of what is a 1-cent piece made?

7. Observe both sides of a 1-cent piece, and describe them carefully.

8. Describe the two sides of a 2-cent piece and of a 3-cent.

*Teach the relative values of a 1-cent piece, a 2-cent piece, and a 3-cent piece.*

*Illustrate with either true money or toy pieces.*

*Teach the relative values of a 1-dollar and of a 2-dollar bill.*

## SEAT WORK.

1. Copy, and fill the blanks:

$$3 - 2 =$$

$$2 \times 1 =$$

$$3 - = 1.$$

$$3 \text{ cents} - 1 \text{ cent} =$$

$$2 \text{ cents} + 1 \text{ cent} =$$

$$1 \text{ cent} + = 3 \text{ cents.}$$

2. Copy:

*cent. cents.*

*dollar. dollars.*

*Pieces of Money.*

*1-cent piece.*

*2-cent piece.*

*3-cent piece.*

*1-dollar bill.*

*2-dollar bill.*

*Copper.*

*Nickel.*

*Silver.*

*Paper.*

## CLASS WORK.

*NOTE.* Toy money should be provided for the children. All questions which involve operations in buying, selling, and making change, should be practically illustrated.

Let the children play at "keeping store."

Make up many questions like these :

1. Here is a 2-cent piece. Give me two pieces of money which together are worth as much as this one piece.

2. Here is a 3-cent piece. Give me two pieces of money which together are worth as much.

What three pieces are worth the same ?

3. Did you ever see a 3-dollar bill ? (*Teacher explain that there are 1-dollar and 2-dollar bills, but no 3-dollar bills.*)

4. What two bills are together worth 3 dollars ?

5. Fred buys a book for 3 dollars. What is the smallest number of pieces of money with which he can pay for it ?

## SEAT WORK.

1. Draw a line of any length on your slates.

2. Draw another line just twice as long.

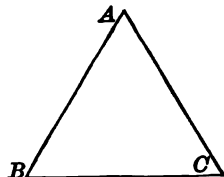
3. Draw a triangle.

4. Draw a triangle with one corner or angle square, thus :



5. How many sharp corners or angles has it ?

6. Here is a triangle, each side of which is 1 inch long.



We name the corners or angles *A*, *B*, and *C*. How far is it from *A* to *B* by way of *C* ?

7. How far is it around the triangle from *A* back to the same point ?

8. Copy :

$$3 \text{ feet} = 1 \text{ yard.}$$

$$2 \text{ feet} + 1 \text{ foot} =$$

$$1 \text{ foot} + 2 \text{ feet} =$$



## CLASS WORK.

*NOTE. Each question should be illustrated "by experiment,"—that is, the child should see that which is talked about, and should do the actual measuring himself.*

1. Measure and cut a string 1 foot long.

2. Measure and cut a string 1 yard long.

3. How many 1-foot strings can be cut from the yard string? Try it, and see.

4. Into how many pieces, each a foot long, can a yard-stick be cut?

5. On the yard-stick, at just one foot from each end, make a mark. How far apart are the two lines you have thus made?

6. Hold your hand 1 foot above the floor; 2 feet; 3 feet.

7. Measure the height of your desk, in feet. Measure the width of your desk, in feet.

8. If 3 hats cost 3 dollars, how much is that apiece?

9. What cost 3 books at 1 dollar each?

*Make up many such questions.*

## SEAT WORK.

Copy, and fill the blanks:

$$1 + 1 + 1 =$$

$$2 + 1 =$$

$$2 \times 1 =$$

$$3 \times 1 =$$

$$3 - 1 =$$

$$2 + \quad = 3.$$

$$1 \times \quad = 3.$$

$$1 + \quad = 3.$$

$$\quad + 1 = 2.$$

Memorize:

$$2 + 1 = 3.$$

$$1 + 2 = 3.$$

$$3 - 1 = 2.$$

$$3 - 2 = 1.$$

$$3 \times 1 = 3.$$

$$1 \times 3 = 3.$$

Copy:

*Angle.*

*Triangle.*

*Every triangle has three angles.*

*Every triangle has sides.*

Draw a triangle with one corner square.

## THE NUMBER FOUR.

## CLASS WORK.

Here are 3 blocks. I put 1 more block on the table with them. Now how many blocks are there?

Three and one are how many?

*Show how to write the figure 4.*

Put down 2 sticks.

Now put down enough more to make 4 sticks.

How many did you put down at first? How many next?

Then 2 and 2 are how many?

Write it:  $2 + 2 = 4$ .

Four is how much greater than 3?

Four is how much greater than 2?

Four is how much greater than 1?

One is how much less than 4?

Two is how much less than 4?

Three is how much less than 4?

*Let the children point out four objects in the room. Let them name four objects which they think of, not in the room.*

*Give many such exercises.*

## SEAT WORK.

1. Write these words:

*One. Two. Three.  
Four.*

2. Write four lines of 4's, thus:

4 4 4 4	4 4 4 4
4 4 4 4	4 4 4 4
4 4 4 4	4 4 4 4
4 4 4 4	4 4 4 4

1 inch.

3. Make the figure 4 with sticks.

4. Draw a line on your slate four inches long.

5. How much longer is it than a line 2 inches long?

1 inch.

6. Find a stick four inches long.

7. Find four sticks which together are equal to it.

8. Find two sticks of the same length which together are equal to it.

1 inch.

1 inch.

1 inch.

1 inch.

1 inch.

1 inch.

## CLASS WORK.

John has 1 cent, Frank has 1 cent, May has 1 cent, Rose has 1 cent. How many cents have they all together?

Write it:  $1 + 1 + 1 + 1 = 4$ .

2. Mary has 2 apples, Ida has 1 apple, and Ella has 1 apple. How many apples have they all together?

Write it:  $2 + 1 + 1 = 4$ .

3. Charles earned three cents yesterday, and 1 cent to-day. How many cents did he earn both days?

Write it:  $3 + 1 = 4$ .

4. Helen is 4 years old. She is 1 year older than Frank. How old is Frank?

*Make up other questions similar to the above.*

*Let the children ask each other questions. Teach close observation and accurate thinking.*

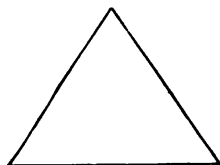
*Illustrate every new operation by using objects.*

*For example:*

*Push out 1 block — pupils say, "One." Push out 3 blocks — pupils say, "Three." Push out all together — pupils say, "Four."*

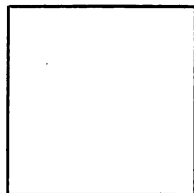
## SEAT WORK.

1. Take three sticks each an inch long, and make of them a figure like this:



2. Draw the same kind of a figure and write its name.

3. Take 4 sticks, and make a figure like this, with 4 sides and 4 square corners.



4. Make the same kind of a figure on your slates.

We call such a figure a *square*.

5. Learn this: A **Square** is a figure having four equal sides and four square corners or angles.

6. Copy these words:

*Triangle. Square.*

## CLASS WORK.

1. *Put down four blocks—pupils say, “Four.” Take 3 of them away—pupils say, “One.”*

Three from 4 leaves how many?

Write it  $4 - 3 = 1$ .

*Pursue the same course with  $4 - 2$ ,  $3 - 2$ ,  $4 - 1$ .*

2. Here are 2 balls, and here are 2 balls. How many times 2 balls?

How many balls all together?

Then 2 times 2 balls are how many?

Write it  $2 \times 2 = 4$ .

3. Here are 4 balls. Let us see how many times 2 balls are here. I divide the 4 into 2's—then here are 2, and here are 2. How many 2's in 4?

*Continue such exercises several days, or until pupils thoroughly understand.*

4. How many more sides has a square than a triangle?

Observe that the four sides of a square must always be of equal length. But the sides of a triangle may be of different lengths.

## SEAT WORK.

1. Cut a strip of paper, making it just 4 inches long.

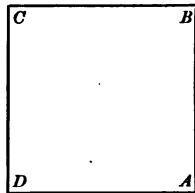
2. Into how many strips 2 inches long can you divide it? Try it, and see.

3. Cut another strip just 4 inches long. Into how many strips 1 inch long can you divide it? Try it, and see.

4. Here is a line 4 inches long. How many sticks each 1 inch long will be equal to it in length? Try it.

5. How many sticks 2 inches long will equal it?

6. Measure this square.



What is the distance around it?

7. What is the distance from *A* to *B*?

8. What is the distance from *A* to *C*?

9. Draw four lines, each 1 inch long.

## CLASS WORK.

1. How many times is one inch contained in 2 inches? Illustrate fully.

We say, 1 inch in 2 inches, 2 times. We write it thus:

$$\begin{array}{r} 1 \overline{)2} \\ 2 \end{array}$$

2. How many times are two inches contained in 4 inches?

Write it  $\begin{array}{r} 2 \overline{)4} \\ 2 \end{array}$

3. Here are four blocks. I want to divide them between 2 boys, giving the same number to each. How many shall I give to each?

We write it in the same way:

$$\begin{array}{r} 2 \overline{)4} \\ 2 \end{array}$$

4. *Illustrate the same principle in a variety of ways, always with objects.*

5. Read the following expressions:

$$2 + 2 = 4.$$

$$4 - 2 = 2.$$

$$2 \times 2 = 4.$$

$$\begin{array}{r} 2 \overline{)4} \\ 2 \end{array}$$

6. Write four similar expressions on the blackboard.

## SEAT WORK.

1. Draw on your slates two lines of the same length as these:

2. How long is line *A*?  
How long is line *B*?

3. Divide each of these lines into 2 equal parts.

4. Divide line *A* into four equal parts.

5. How much longer is line *A* than line *B*?

6. Find a stick the length of line *B*.

Find one the length of line *A*.

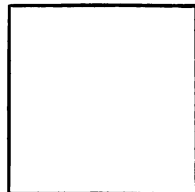
7. How many sticks the length of line *B* can you make from the longer stick? Try it, and see.

8. Copy this:

$$\frac{1}{2} \text{ of } 4 = 2.$$

$$\frac{1}{2} \text{ of } 2 = 1.$$

9. Draw a square on your slates, making it just as large as this:



## CLASS WORK.

1. Ida has a one-cent piece and a three-cent piece. How much money has she?

2. She wants to spend one-half of her money for candy. How much candy can she buy?

3. She gives the clerk her 3-cent piece. How much change must he give her back?

4. She finds that she got 2 sticks of candy for her money. How much was that a stick?

5. Make a line on the blackboard 2 feet long.

6. Now make another line half as long. What is the half of 2 feet?

7. Cut a string so that it will be 2 yards long. Cut it in halves.

8. Tom has 4 pencils, and Anna has half as many. How many has Anna?

9. Anna has 2 apples, and she gives half of them to Tom. How many has she left?

10. Make on the blackboard a square whose sides shall each be 2 feet long. Make one whose sides are each 1 foot long.

## SEAT WORK.

$$3 \text{ cts.} + 1 \text{ ct.} =$$

$$\frac{1}{2} \text{ of } 4 \text{ cts.} =$$

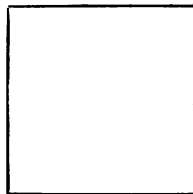
$$3 \text{ cts.} - = 2 \text{ cts.}$$

$$2 \overline{) 2}$$

$$1 \text{ ft.} + 1 \text{ ft.} =$$

$$\frac{1}{2} \text{ of } 2 \text{ ft.} =$$

Make with sticks a square just as large as this :



If all the sticks were placed in a line, how long would that line be? Try it.

$$4 \times 1 = \text{how many?}$$

Copy :

$$\frac{1}{2} = \text{one-half.}$$

Copy, and fill the blanks :

$$2 \times 2 =$$

$$2 + 1 =$$

$$2 \overline{) 4}$$

$$\frac{1}{2} \text{ of } 4 =$$

$$1 + 1 + 2 =$$

$$4 - 2 =$$

$$4 - 1 - 1 =$$

## CLASS WORK.

1. Albert has 4 cents; he spends half his money. How much has he left?

2. If 1 foot of ribbon cost 1 cent, what will 3 feet cost?

3. How many feet in 1 yard?

4. If a yard of silk cost 4 dollars, what will  $\frac{1}{2}$  yard cost?

5. If a yard of rubber pipe cost three dollars, what will one foot cost?

6. Tom has a 2-cent piece, and Harry has a piece which is worth just half as much. What is Harry's piece?

7. James buys a pencil for 2 cents, and sells it for twice as much as he gives. How much does he get for it? How much does he gain?

8. Alice's pet hen had 4 chickens. A hawk caught half of them; how many were left?

9. Mary's new dress cost 2 dollars, and Ella's cost half as much. How much did Ella's cost? How much did both cost?

*Continue such exercises another day.*

## SEAT WORK.

1. Copy:

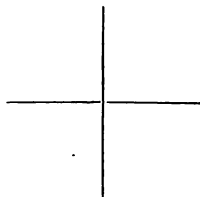
*3 feet = 1 yard.*

2. Draw a triangle, making the lines of any length you choose, but all the same length.

3. Draw a square, making the lines of the same length as those of the triangle.

4. Draw a line 4 inches long. Divide it into 4 equal parts.

5. Draw a line 2 inches long. Draw another line 2 inches long through the middle of the first, as below:



6. Draw a line 1 inch long. Draw another line just half as long.

$\frac{1}{2}$  inch.

7. Copy, and learn:

$$\frac{1}{2} \text{ of } 4 = 2.$$

$$\frac{1}{2} \text{ of } 2 = 1.$$

$$\frac{1}{2} \text{ of } 1 = \frac{1}{2}.$$

## CLASS WORK.

1. Here is a measure which holds one pint.

*Let each child see and handle the measure.*

2. Here is another measure which holds one quart.

*Let each child see, etc.*

3. Which is the larger of the two measures?

4. John may fill the pint measure with water.

We have here a pint of water.

5. Anna may fill the quart measure with water.

We have here a quart of water.

6. We will empty the quart measure.

Now see how many pints of water will be required to fill it.

*Continue, and vary these experiments.*

We say,

“Two pints, one quart.”

7. How many pints in one quart?

8. One pint is what part of a quart?

9. If a quart of milk cost 4 cents, what does a pint cost?

## SEAT WORK.

1. Copy this, and learn it by heart:

*Two pints, one quart.*

2. Copy:

*pint. pints.*

*quart. quarts.*

*inch. inches.*

*foot. feet.*

*yard. yards.*

*cent. cents.*

*dollar. dollars.*

3. Memorize thoroughly:

$$2 \times 1 = 2.$$

$$2 \times 2 = 4.$$

$$2 + 1 = 3.$$

$$2 + 2 = 4.$$

$$\frac{1}{2} \text{ of } 4 = 2.$$

$$\frac{1}{2} \text{ of } 2 = 1.$$

4. Write the words:

Triangle, triangles.

Square, squares.

5. Write this:

A triangle has three sides. A square has four equal sides.



## CLASS WORK.

*Let the children spend a good deal of the time measuring. Let them learn by observation.*

1. Which is more, 1 quart or 1 pint? How much?

2. Which is more, 1 quart or 2 pints?

3. Which is more, 3 pints or 1 quart? How much?

4. How many pints in one quart? in 2 quarts?

5. John sold 2 pints of milk to Mr. Smith, and half as much to Mr. Jones. How much did he sell to Mr. Jones? How much did he sell to both men?

6. What is  $\frac{1}{2}$  of 1 gallon?

7. In 4 pints how many quarts?

8. Are three pints more or less than two quarts? How much? Are they more or less than 1 quart?

9. With the pint measure, measure  $\frac{1}{2}$  of 4 pints. How many quarts is this?

*Let the answers to all these questions be obtained by actual measurements. Let the results be written in proper form.*

## SEAT WORK.

1. Measure this line :

\_\_\_\_\_

2. Draw a line half as long on your slates.

3. How long is the line you have drawn?

4. Write :  $\frac{1}{2}$  of 1 inch =  $\frac{1}{2}$  inch.

5. Draw a line 2 inches long :

6. Draw another line just half as long.

7. How long is this line?

8. Write :  $\frac{1}{2}$  of 2 in. = 1 in.

9. Draw a line 4 inches long.

10. Draw another line just half as long.

11. How long is the last line?

12. Write :  $\frac{1}{2}$  of 4 in. = in.

13. Draw a square, each side of which is 2 inches.

14. Draw a square, each side of which is  $\frac{1}{2}$  as long.

15. Notice the difference in the sizes of these squares.

16. How many square inches make a square 2-inches? Try it, and see.

2 inches.

1 inch.

$\frac{1}{2}$  inch.

$\frac{1}{4}$  inch.

## CLASS WORK.

*Show how to find one-half of three.*

*Show how to write  $1\frac{1}{2}$ .*

Here are 3 apples. I want to give half of them to Mary, and the other half to Ida. How shall I divide them?

*Let the children solve this question by actually dividing the apples.*

Charles gave 3 cents for 2 oranges. How much was that apiece?

What is the half of 3?

$\frac{1}{2}$  of 3 = what?

*Illustrate the same by using different objects.*

How many pints in 1 quart?

*The children should obtain the result first by actual measurement.*

How many pints in  $\frac{1}{2}$  quart?

How many pints in  $1\frac{1}{2}$  quarts?

How many pints in 2 quarts?

How many quarts = two pints?

Four pints = how many quarts?

*Continue such exercises another day.*

## SEAT WORK.

1. Measure and cut a string 1 foot long.

2. Measure and cut a string  $\frac{1}{2}$  foot long.

3. Measure and cut a string 1 yard long.

4. How many 1-foot strings can you cut from the yard string? Try it.

5. How many feet in 1 yard?

6. How many feet in  $\frac{1}{2}$  yard?

7. Draw a line 3 inches long on your slate.

8. Divide this line into 2 equal parts. How long is each part?

9. Draw another line 3 inches long.

10. Divide this into 3 equal parts. How long is each part?

11. Draw 3 lines on your slates, each 1 inch long.

12. Draw 3 other lines, each  $\frac{1}{2}$  as long.

13. Now draw a line as long as the last three lines put together.

14. Draw a line twice as long as the last.

3 inches.

## CLASS WORK.

*Review what has already been learned about the measurement of liquids.*

*Give additional exercises until the relative value of a pint and a quart is fully understood.*

*Exercises like the following may then be given in continuation of the lessons in long measure.*

1. If 1 yard of ribbon cost 4 cents, what will  $\frac{1}{2}$  yard cost?

2. If 1 foot of wire cost 1 cent, what will 1 yard cost?

3. Draw a line on the blackboard 1 yard long.

4. Divide this line into 3 equal parts. How long is each part?

5. Draw another line on the blackboard 1 yard long. Divide this line into two equal parts. How long is each part?

6. Draw a line 4 feet long.

7. Draw beneath it another line 1 yard long.

8. How much more than 1 yard is 4 feet?

9. Draw a line 2 feet long.

10. How much less than 1 yard is 2 feet?

## SEAT WORK.

1. Copy, and learn by heart:

$\frac{1}{2}$  of 1 in. =  $\frac{1}{2}$  in.

$\frac{1}{2}$  of 1 ft. =  $\frac{1}{2}$  ft.

$\frac{1}{2}$  of 1 yd. =  $1\frac{1}{2}$  ft.

$\frac{1}{2}$  of 1 qt. = 1 pt.

2. Copy the following, and fill the blanks in the last four lines:

qt. means quart.

pt. means pint.

ft. means foot.

ft. means feet.

in. means inch.

in. means inches.

ct. means \_\_\_\_\_

X means \_\_\_\_\_

= means \_\_\_\_\_

+ means \_\_\_\_\_

3. Copy, and fill the blanks:

In 1 quart there are .... pints.

In 1 quart there are .... half-pints.

In 4 pints there are .... quarts.

## CLASS WORK.

1. If 1 quart of buttermilk cost 2 cents, what will  $\frac{1}{2}$  quart cost?

What is  $\frac{1}{2}$  quart? (1 pt.)

2. If 1 quart of buttermilk cost 2 cents, what will 1 pint cost?

3. If 1 pint of sugar-water cost 2 cents, what will 2 pints cost?

Two pints = what?

4. If 1 pint of sugar-water cost 2 cents, what will 1 quart cost?

*Make up other questions similar to the above.*

*Let the children ask each other questions.*

5. Here is a larger measure which we call a Gallon. You may all write the word *gallon*.

6. John may show us how many quarts of water this gallon measure will hold.

7. Write this on the black-board and on your slates:

Four quarts in one gallon.

*Let them measure, and buy, and sell, in illustration of the questions asked.*

## SEAT WORK.

1. Write, and fill the blanks:

*pint. quart.  
gallon.*

*2 pints are 1 -----  
----- quarts are 1  
gallon.*

1 pint = quart.

2 pints = quart.

3 pints = quarts.

4 pints = quarts.

4 quarts = 1 gallon.

2 quarts = gallon.

2 quarts = pints.

1 quart = pints.

2. Memorize:

Four quarts 1 gallon.

3. Write, and fill the blanks:

$\frac{1}{2}$  quart = pint.

$\frac{1}{2}$  gallon = quarts.

A gallon is .... times as much as a quart.

A quart is .... times as much as a pint.

A pint is .... of a quart.

## CLASS WORK.

If we divide anything into two equal parts, what do we call each part?

If we divide anything into three equal parts, we call each part one-third.

*Illustrate the idea of one-third by numerous examples.*

Here are 3 apples: if I divide them equally among 3 boys, how many will each have?

$\frac{1}{3}$  of 3 = how many?

$\frac{1}{3}$  of 3 ft. = how many?

$\frac{1}{3}$  of 1 yd. = how many feet?

*If the above is not perfectly clear, let pupils perform actual work until they understand it thoroughly.*

*Continue for another day, making up many other questions similar to the above.*

---

*Review what has been learned about squares and triangles.*

A square has how many sides?

How must these sides be with respect to each other?

How many angles has a square? What kind of angles must they be?

## SEAT WORK.

1. Copy on your slates:

$$3 + 1 =$$

$$4 - 1 =$$

$$2 \times 2 =$$

$$\times 1 = 4.$$

$$- 1 = 2.$$

$$2 \overline{) 4}$$

$$\frac{1}{3} \text{ of } 4 =$$

$$\frac{1}{3} \text{ of } 3 =$$

$$2 + 2 =$$

$$3 + = 4.$$

$$3 \times 1 =$$

$$4 - = 2.$$

$$2 + = 4.$$

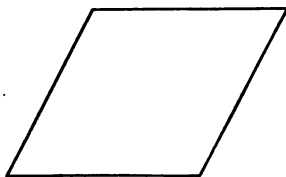
$$2 \overline{) 2}$$

$$\frac{1}{2} \text{ of } 2 =$$

$$\frac{1}{2} \text{ of } 4 =$$

$$\frac{1}{2} \text{ of } 2 + \frac{1}{2} \text{ of } 4 =$$

2. Draw a figure like this, making each side one inch in length.



Is it a square?

If not, why not?

## CLASS WORK.

*Explain and illustrate fully what is meant by "one-quarter" or "one-fourth."*

*Use objects for illustration.*

*Show how to write  $\frac{1}{4}$ .*

1.  $\frac{1}{4}$  of 4 = how many?

Illustrate.

2. How many quarts are one gallon?

3.  $\frac{1}{4}$  of 4 quarts = how many quarts?

4.  $\frac{1}{4}$  of 1 gallon = how many quarts?

5. A milkman divided 1 gallon of milk equally among 4 customers; how much did he give to each customer?

6. Divide 4 cents equally among 4 boys; how much does each receive?

7.  $\frac{1}{4}$  of 4 cents = how many cents?

8. Mary had 4 apples, and James had half as many. How many apples had James?

9. John had  $\frac{1}{4}$  as many apples as Mary; how many had he?

10. How many apples had James and John together?

## SEAT WORK.

*To be memorized.*

$$2 \times 1 = 2.$$

$$2 \times 2 = 4.$$

$$3 \times 1 = 3.$$

$$4 \times 1 = 4.$$

$$2 + 2 = 4.$$

$$3 + 1 = 4.$$

$$3 - 1 = 2.$$

$$3 - 2 = 1.$$

$$4 - 1 = 3.$$

$$4 - 2 = 2.$$

$$4 - 3 = 1.$$

Copy, and fill the blanks:

$$\frac{1}{4} \text{ of } 4 =$$

$$\frac{1}{2} \text{ of } 4 =$$

$$\frac{1}{2} \text{ of } 2 =$$

$$\frac{1}{2} \text{ of } 3 =$$

$$4 \overline{)4}$$

$$2 \overline{)4}$$

$$2 \overline{)2}$$

$$2 \overline{)3}$$

Memorize:

$$\frac{1}{2} \text{ of } 2 = 1.$$

$$\frac{1}{2} \text{ of } 3 = 1\frac{1}{2}.$$

$$\frac{1}{2} \text{ of } 4 = 2.$$

Divide this line into 4 equal parts:

---

2 inches.

## REVIEW QUESTIONS.

1. Nat had 3 marbles and bought 1 more; how many marbles had he then?

2. Three boys were in the room, and 2 of them went out; how many remained?

3. John had 4 apples, but gave  $\frac{1}{2}$  of them to Frank; how many had he left?

4. Anna is 4 years old, and Jane is half as old as Anna; how old is Jane?

5. A farmer sold 4 bushels of wheat for 4 dollars. How much was that per bushel?

6. If a pint of buttermilk costs 2 cents, how much will 1 quart cost?

7. How many quarts in a half-gallon?

8. How many quarts in 4 pints?

9. John picked a quart of berries each day for 4 days. How much did he pick all together?

10. Mary had 4 cents which she divided equally between two beggars. How much did she give to each?

## REVIEW WORK.

1. Draw a line 1 inch long.

2. Draw a line twice as long as the first.

3. Draw another line twice as long as the last.

4. Draw a triangle.

5. Draw another triangle, making the sides twice as long as the sides of the first.

6. Draw a square, making each side one inch in length.

7. Draw a square, making each side 2 inches long.

8. Learn this:

*The opening between two lines which meet is called an **Angle**.*

*A square "corner," or angle, is called a **Right Angle**.*

9. Draw four right angles.

10. Draw four angles that are not right angles.

11. Copy the following, and fill blanks wherever they occur:

$$1 + 1 + 1 =$$

$$3 \times 1 =$$

$$1 + 3 \times 1 =$$

$$\frac{1}{2} \text{ of } 4 =$$

$$\frac{1}{4} \text{ of } 4 =$$

$$\frac{1}{2} \text{ of } 4 + \frac{1}{4} \text{ of } 4 =$$

$$\frac{1}{2} \text{ of } 4 + \frac{1}{2} \text{ of } 3 =$$

## CLASS WORK.

1. If 4 hats cost four dollars, how much does each hat cost ?

2. What will 3 hats cost at the same rate ?

3. If 3 pens cost 3 cents, what will 1 pen cost ? What will 2 pens cost ? What will 4 pens cost ?

4. Two is what part of 4 ?

5. One pint is what part of 1 quart ?

6. One quart is what part of 1 gallon ?

7. Two quarts is what part of a gallon ?

8. How many right angles has a square ?

9. How many right angles may a triangle have ?

10. Draw a four-sided figure which is not a square. Can you draw a three-sided figure which is not a triangle ?

11. Four birds were in a tree ; half of them were robins, and half wrens. How many robins were there ? How many wrens ?

12. Harry has 2 cents, and John has twice as many. How many cents has John ?

## SEAT WORK.

1. Make four marks on your slates, each one inch long, without measuring.

2. Make two marks, without measuring, each 2 inches long.

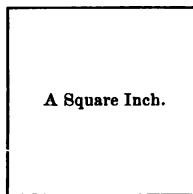
3. Make three marks in the same way, each 3 inches long.

4. Make one mark 4 inches long.

5. Now measure all your lines, and see how correctly you have drawn them.

6. Draw on your slates two lines 1 inch apart.

7. Draw a square, each side of which is 1 inch, thus :



8. Write inside of this figure the words,

*A Square Inch*

9. Now draw a four-sided figure — not a square — whose sides are of equal length.



## CLASS WORK.

1. Tom has two pieces of money, both alike, which together make 4 cents. What are they?

2. Frank has two pieces, both different, which together make 4 cents. What are they?

3. Alice has three pieces of money which together make 4 cents. What are they?

4. Mary paid 3 cents for 2 pencils. How much was that apiece?

*Make up a large number of questions and exercises similar to the foregoing.*

5. Draw on the board a line 1 foot long.

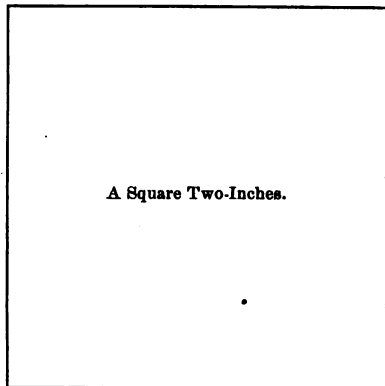
6. Draw a square, each side of which is one foot long. (Measure the lines, and be very exact.)

7. We call this a **Square Foot**. Write the words inside of the square.

*Let all the pupils draw. Let them make squares on their desks with foot rulers. Let them draw a square foot without measuring. Require neatness and accuracy.*

## SEAT WORK.

1. Draw a square, each side of which is 2 inches, as below:



2. Write in it the words:

*A Square Two-Inches.*

3. Find how many square inches can be cut out of a piece of paper 2 inches square.

4. Copy:

*A Square.*

*A Square Foot.*

*Two Square Feet.*

*A Square Two-Feet.*

## CLASS WORK.

1. Here is the best figure (two square feet), drawn on the board yesterday.

2. You may all make a figure like it on your desks, using rulers for lines.

3. John may draw on the blackboard a line 2 feet long.

4. Mary may draw a line 2 feet long, joining with John's line so as to make a square angle, thus :



5. Anna may draw a line 2 feet long, joining it in the same way with Mary's line.

6. Ida may draw a line connecting Anna's line with John's at the ends.

7. What kind of a figure have we now ?

8. What is the length of each side ?

9. Write the name inside.

*Let the children draw their own inferences from what has been done.*

10.. Which is greater, a square 2-feet or two square feet ?

## SEAT WORK.

1. Make a line one inch long on your slates.

2. Make a line one-half inch long, thus : \_\_\_\_\_

3. Cut a strip of paper one-half inch long.

4. Draw a square, each side of which is  $\frac{1}{2}$  inch.

5. Cut a piece of paper the size of this square. Cut four of them.

6. Put 4 of these small squares of paper together, thus :

A Square Half-Inch.	A Square Half-Inch.
A Square Half-Inch.	A Square Half-Inch.

7. Find the length of each side of the larger square by measuring.

8. We call each of the small squares **A Square Half-Inch.**

Write the name on each.

9. What may we call the larger square, which is made by putting the four square half-inches together ?

## BUYING AND SELLING.

*Let the pupils "keep store." A small stock of objects will do to begin with; such as bits of ribbon, thread, nuts, apples, pieces of calico, bright-colored paper, slate-pencils, toy-books, etc. Use toy-money for making purchases, but as yet only one-cent, two-cent, and three-cent pieces. Paper representing one-dollar and two-dollar bills may also be used.*

*No single transaction should at present involve more than 4 cents or 4 dollars.*

*The seller should be able after each transaction to explain it simply and clearly. For example: Let Henry be the storekeeper. A little girl buys 3 papers of pins, at 1 cent per paper, and gives him two 2-cent pieces in payment. He should be able to give the proper change at once, and, if asked to do so, to explain the different operations, somewhat after the following manner:*

*"Mary bought 3 papers of pins, at 1 cent per paper. The whole cost was 3 cents, because 3 times 1 cent are 3 cents. She gave me two 2-cent pieces, equal to 4 cents. Four cents is 1 cent more than 3 cents, the cost of the pins; therefore I must return 1 cent as change."*

*Remember that every explanation must be as simple as it can be given, and generally in the pupil's own way — provided, always, that the results are correct. All mere formal statements, and whatever might become a fixed form of explanation, should be most rigidly avoided. Let every word mean something to the child who uses it.*

*It may sometimes be well to let each pupil be storekeeper for a stated number of days, or until he makes a mistake. A few minutes devoted each day to this "work-play" will serve to give a great deal of the best possible drill in the practical use of numbers.*

## CLASS WORK.

1. Name things which are sold by the yard.

2. Name things which are measured by the foot.

3. Name things which are sold by the pint, quart, or gallon.

4. What is a triangle? Draw one.

5. What is a square? Draw one.

6. When is a square called a square inch? Draw one.

7. When is a square called a square two-inches? Draw one.

8. When is a square called a square yard?

9. How much greater is a yard than a foot? than 2 feet? Measure and see.

10. How much less is a yard than 4 feet?

*Illustrate every point which is not perfectly clear to every pupil.*

11. Draw a square yard on the blackboard.

12. Draw a square yard on the floor.

13. Divide this square yard into two equal parts.

## SEAT WORK.

1. Make two dots two inches apart, thus :

● ●  
2. Join these dots by a straight line.

3. Draw another line joining them, but longer than the first line.

4. Draw lines in the same way joining dots three inches apart; 4 inches apart.

5. Make 4 dots in a straight line and half an inch apart, thus :

● ● ● ●  
6. Make 4 dots half an inch apart, placing them at the corners of a square, thus :

● ●  
● ●  
7. Designate each dot by a letter, thus :

A ● ● B

D ● ● C

8. Join *A* and *B*, *B* and *C*, *C* and *D*, *D* and *A*, by lines.

## CLASS WORK.

1. How many fingers on your right hand ?

2. If you count your thumb as a finger, how many are there ?

3. Lay 5 sticks, each one inch long, on your desks.

4. Find 1 stick which is as long as these 5 taken together.

5. How long is this longer stick ?

6. I will show you how to write the figure 5.

7. Put 5 blocks in a row.

8. Clap your hands five times.

9. Stand, and then take 5 steps forward from your places. Now take five steps backward.

10. Make 5 stars, five rings, 5 crosses, on your slates.

11. Write the names of five things in the schoolroom.

12. Count backwards from 5, this way :

5, 4, 3, 2, 1.

13. How many squares can you make with five sticks ? How many triangles ?

14. Draw a figure having five sides all the same length.

## SEAT WORK.

1. Write each of the following words five times :

One, Two, Three,  
Four, Five.

2. Copy, and fill the blanks :

$$1 + = 5.$$

$$2 + = 5.$$

$$3 + = 5.$$

$$4 + = 5.$$

3. Copy, and fill the blanks :

$$5 - 1 =$$

$$5 - 4 =$$

$$5 - 3 =$$

$$5 - 2 =$$

4. Copy, and fill the blanks :

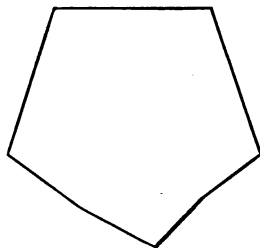
$$5 - = 3.$$

$$5 - = 1.$$

$$5 - = 4.$$

$$5 - = 2.$$

5. Lay five sticks together, this way :



## CLASS WORK.

1. Five cents is how much more than 1 cent?

2. Which is greater, one yard or 5 feet?

3. How much greater? Measure and see.

4. One cent is how much less than 5 cents?

5. Make a line 5 inches long. Rub out 2 inches of this line. How much remains?

6. Take 3 balls in your hand. How many more must you take to have five balls?

7. How many days of school in a week? Name them.

8. How many pencils at 1 cent each can you buy for 5 cents? How many pencils at 2 cents each can you buy for 6 cents?

9. How many quarts in a gallon?

10. Five quarts is how much more than a gallon?

11. How many pints in 1 quart? in 2 quarts?

12. How many quarts in 5 pints?

*Make other similar questions.*

## SEAT WORK.

1. Write the names of four pieces of money.

2. Write the names of the school-days in a week, thus:

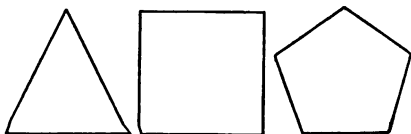
*Monday.*  
*Tuesday.*  
*Wednesday.*  
*Thursday.*  
*Friday.*

3. Draw a line five inches long. Divide it into five equal parts.

4. Draw five lines, all of different lengths, the first 1 inch long, the second 2 inches long, and the fifth 5 inches long.

5. Take 5 sticks of different lengths, also 5 of the same length.

6. Draw figures like these, and notice their difference:



## CLASS WORK.

1. How many small pieces of money have we? (*Ans.* Four: a cent, two cents, three cents, five cents.)

2. I will now show you three pieces of paper money: This is a *dollar bill*; this is a *two-dollar bill*; this is a *five-dollar bill*.

3. How many large pieces of money have I shown you? (*Ans.* Three: a dollar, two dollars, five dollars.)

4. John has 2 pieces of money, which together are worth 5 cents; what are the two pieces?

5. Henry has 3 pieces, which together make 5 cents. What are they?

6. Anna has 3 pieces, which together make 5 dollars. What are they?

7. Clara buys 5 cents' worth of candy and gives two pieces of money to pay for it. What were the pieces?

8. Fred bought 3 cents' worth of thread, and gave the shop-keeper 5 cents. How much change is due him?

## SEAT WORK.

1. Copy, and fill the blanks:

$$3 + 2 =$$

$$1 + 3 + = 5.$$

$$2 + = 5.$$

$$5 - 3 =$$

$$5 - = 1.$$

$$5 \times 1 =$$

2. Copy:

$$2 \text{ apples} + 3 \text{ apples} =$$

$$4 \text{ cents} - 1 \text{ cent} =$$

$$5 \times 1 \text{ apple} =$$

$$1 \times 5 \text{ apples} =$$

3. Draw five squares, each one inch square.

4. Write each of these words five times:

*Cent.*      *Cents.*  
*Dollar.*      *Dollars.*

5. Write the names of five objects in the schoolroom; of five objects out of the school-room.

6. Write the names of five boys; of five girls.

7. Copy, and fill the blanks:

$$1 \text{ yard} = \quad \text{feet.}$$

$$1 \text{ yard} + 1 \text{ foot} = \quad \text{feet.}$$

$$1 \text{ yard} + \quad \text{feet} = 5 \text{ feet.}$$

## CLASS WORK.

*Illustrate each of the following (so far as necessary) with objects.*

1. If we divide anything into 2 equal parts, what is each part called?

2. If we divide anything into 3 equal parts, what is each part called?

What do we call 2 of these parts taken together?

*Show how to write  $\frac{2}{3}$ .*

3. If we divide anything into four equal parts, what is one of the parts called? Two of the parts taken together? Three of the parts taken together?

*Show how to write  $\frac{2}{4}$  and  $\frac{3}{4}$ .*

4. Show that one-half is the same as two quarters. Consequently,  $\frac{1}{2} = \frac{2}{4}$ .

5. If we divide anything into 5 equal parts, we call one of these parts one-fifth.

*Show how to write  $\frac{1}{5}$ .*

6. If John has 5 marbles, and Henry has  $\frac{1}{5}$  as many as John, how many has Henry?

7. Mabel has 3 apples, and Anna has  $\frac{2}{3}$  as many. How many has Anna?

## SEAT WORK.

1. Copy, and fill the blanks:

$$\frac{1}{2} \text{ of } 4 \text{ in.} = \quad \text{in.}$$

$$\frac{1}{3} \text{ of } 3 \text{ in.} = \quad \text{in.}$$

$$\frac{1}{4} \text{ of } 4 \text{ in.} = \quad \text{in.}$$

$$\frac{1}{5} \text{ of } 5 \text{ in.} = \quad \text{in.}$$

$$\frac{1}{3} \text{ of } 3 \text{ ft.} = \quad \text{ft.}$$

$$\frac{1}{3} \text{ of } 1 \text{ yd.} = \quad \text{ft.}$$

$$2)\underline{4} \quad 3)\underline{3} \quad 4)\underline{4} \quad 5)\underline{5}$$

$$\frac{1}{2} \text{ of } 2 = \quad \frac{1}{2} \text{ of } 4 =$$

$$\frac{1}{2} \text{ of } 1 = \quad \frac{1}{2} \text{ of } 1 =$$

$$\frac{1}{2} \text{ of } 3 = \quad \frac{1}{2} \text{ of } 5 =$$

2. Draw five squares, each 1 in. square.

3. Draw a line five inches long.

4. Divide this line into 5 equal parts.

5. Draw another line as long as 2 of these parts.

6. Draw another as long as 3 of these parts.

7. Draw another as long as 4 of these parts.

8. Draw four right angles.

9. Draw four angles that are not right angles.

10. Draw a figure that shall contain five angles.



## CLASS WORK.

1. Draw on your slates a line 5 inches long. Draw by the side of it another line  $\frac{1}{2}$  as long.

2. Draw a line 2 inches long.

3. Draw a line  $\frac{2}{3}$  of 5 inches long.

4. Draw on the blackboard a line 1 foot long.

5. Draw another line 5 ft. long.

6. Draw another line  $\frac{1}{2}$  of 5 ft. long.

*Make up many other exercises similar to the above.*

1. Measure on floor, or blackboard, a line 1 yd. and 2 ft. long.

2. How many feet long is this line?

3. Measure on the floor a line 5 yards long.

4. Measure another line 5 feet long. Cut a string the length of this line.

5. Measure things about the schoolhouse which are less than 5 feet long.

6. How many feet high are you?

*Continue such exercises another day or two.*

## SEAT WORK.

Copy, and fill blanks:

$$\frac{1}{2} \text{ of } 5 \text{ in.} = \text{ in.}$$

$$\frac{2}{3} \text{ of } 5 \text{ in.} = \text{ in.}$$

$$\frac{3}{4} \text{ of } 5 \text{ in.} = \text{ in.}$$

$$\frac{4}{5} \text{ of } 5 \text{ in.} = \text{ in.}$$

$$5 \times 1 =$$

$$3 - 1 =$$

$$6 + 2 =$$

$$2 \overline{)5}$$

$$3 + 1 =$$

$$5 - 4 =$$

$$4 \times 1 =$$

$$1 + (4 \times 1) =$$

*(Teacher explain the last expression.)*

Copy, and fill blanks:

$$1 \text{ yd.} = \text{ ft.}$$

$$1 \text{ yd.} + 1 \text{ ft.} = \text{ ft.}$$

$$1 \text{ yd.} + 2 \text{ ft.} = \text{ ft.}$$

$$\frac{1}{2} \text{ of } 5 \text{ yd.} = \text{ yd.}$$

$$5 \overline{)5}$$

$$1 \text{ qt.} = \text{ pt.}$$

$$2 \text{ qt.} = \text{ pt.}$$

$$2 \text{ qt.} + 1 \text{ pt.} = \text{ pt.}$$

*(In case of any doubt concerning any of the above, measure and see.)*

## CLASS WORK.

1. How many quarts equal one gallon?

2. Five quarts are how much more than a gallon? How many pints more than a gallon?

3. What cost 2 pints of milk at 5 cents a quart?

4. What costs 1 pint of milk at the same price?

5. How many quarts in 4 pints?

6. How many quarts in 5 pints?

*(Let the children measure, and thus verify and illustrate each result.)*

**Dry Measure.**

*The school should be provided with the following dry measures:*

*A dry quart.*

*A half-peck.*

*A peck.*

*A half-bushel.*

*Use at first only the peck and the half-bushel.*

*Explain the use of these measures.*

*Name things measured by the bushel; by the peck.*

## SEAT WORK.

1. Draw a triangle having one side 1 inch long and each of the other sides 5 inches long.

2. With sticks make a triangle having one side 1 inch long and each of the other sides 2 inches long.

3. Draw a square five-inches.

4. Draw two lines one inch apart and five inches long.

5. Join the ends of these lines with shorter lines, so as to make a figure like this:



6. Draw a triangle having one square or right angle.

Write under it its name:

A Right Triangle.

7. Draw a triangle having three sharp angles.

Write under it its name:

An Acute Triangle.

The word *acute* means *sharp*.

8. Draw a triangle having one angle more open than that of a right triangle.

Write under it its name:

An Obtuse Triangle.

The word *obtuse* means *dull*.

## CLASS WORK.

1. John bought five apples at 1 cent each. What did all cost?

2. He paid for them with two pieces of money. —?

3. He ate two of the apples. —?

4. He gave one of them to Henry. —?

5. He sold those that were left at 2 cents each. —?

6. How much money has he?

7. This money is in three pieces. —?

8. Measure some things which are about 5 feet long.

9. How much more than a bushel is 5 pecks?

10. How much less than 5 quarts is 1 gallon?

11. Five pecks is how much more than four pecks?

12. Four pecks = what?

13. Five pecks is how much more than one bushel?

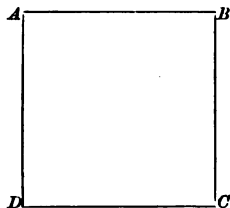
14. Two pecks is what part of a bushel?

*Let the children perform actual measurements, and see whether their conclusions are correct.*

## SEAT WORK.

1. Draw a square one-inch.

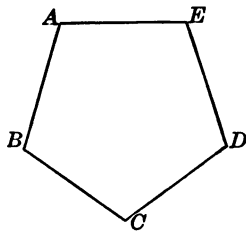
2. Write letters at the corners, as below:



3. Draw a line from *A* to *C*.

4. Into how many triangles does this line divide the square?

5. Draw a five-sided figure, making each side as nearly one inch long as possible, thus:



6. Into how many triangles can this figure be divided by drawing lines from the corner *A* to *C* and to *D*? Try it, and see.

7. From a point in the centre of this figure draw a line to each corner. How many triangles are there?

## CLASS WORK.

1. What cost three bushels of corn at 1 dollar a bushel?

2. If one bushel of grass-seed cost 4 dollars, what will 1 peck cost?

3. If 1 peck of lemons cost 1 dollar, what will  $\frac{1}{2}$  bushel cost?

4. How many pints in 2 quarts? How many pints in half a quart?

5. How many pints in  $2\frac{1}{2}$  quarts? How many in  $1\frac{1}{2}$  quarts?

6.  $2 \times 2\frac{1}{2}$  = what?

7. When lemons are two cents each, how many can you buy for 4 cents?

8. Henry buys 2 sticks of candy for 3 cents. How much is that a stick?

9. How many such sticks can he buy for 5 cents?

10. Anna has two pieces of money which together equal 5 cents. What are they?

11. If she pays 2 cents for a pencil, and 2 cents for a sponge, how much has she left?

*Make up many similar questions.*

## SEAT WORK.

Copy, and fill the blanks:

$$- 4 = 1.$$

$$4 + 1 =$$

$$5 - 2 =$$

$$5 - = 1.$$

$$2) \underline{5}$$

$$2 \times 2 =$$

$$1 \times 5 =$$

$$5 - 3 =$$

$$\frac{1}{2} \text{ of } 4 =$$

$$5 - = 2.$$

$$5 - 1 =$$

$$3 + = 5.$$

$$5 - 2 =$$

$$4 \times 1 =$$

$$\frac{1}{2} \text{ of } 5 =$$

$$3 - 1 =$$

$$3 + 2 =$$

$$1) \underline{5}$$

$$4 - 2 =$$

$$\frac{1}{2} \text{ of } 4 =$$

$$\frac{1}{2} \text{ of } 5 =$$

$$5 - 1 =$$

$$2) \underline{\quad}$$

$$2 \times 1\frac{1}{2} =$$

$$3 \times 1\frac{1}{2} =$$

$$2 \times 2\frac{1}{2} =$$

## CLASS WORK.

1. Here is a postage-stamp worth 2 cents, and here is one worth 1 cent. These are the stamps most used.

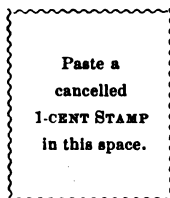
*Explain the use of postage-stamps. The postage on a letter; the postage on a small circular.*

2. How many 2-cent stamps will it take to mail two letters?

3. What will it cost to mail 2 letters and a circular, in separate envelopes?

4. How many circulars can you mail for 5 cents?

5. How many 1-cent stamps will it take to mail one letter?



There are also 3-cent, 4-cent, and 5-cent stamps.

6. Find 3 stamps which are together worth 5 cents.

7. A five-cent stamp is worth as much as how many two-cent stamps?

## SEAT WORK.

1. Copy, and fill blanks :

$\frac{1}{2}$  of 2 =

$\frac{1}{2}$  of 3 =

$\frac{1}{2}$  of 4 in. =

$\frac{1}{2}$  of 5 ft. =

$\frac{1}{2}$  of 1 yd. =

$\frac{1}{2}$  of 3 =

$\frac{1}{2}$  of 4 qts. =

$\frac{1}{2}$  of 1 gal. =

$\frac{1}{2}$  of 4 pecks =

$\frac{1}{2}$  of 1 bushel =

$\frac{1}{2}$  of 5 cents =

$\frac{1}{2}$  of 5 apples =

$\frac{1}{2}$  of 5 apples =

2. Write :

pt. = pint.

qt. = quart.

gal. = gallon.

pk. = peck.

bu. = bushel.

3. Write the names of things that are sold by the quart or the gallon.

4. Write the names of things that are sold by the peck or the bushel.

5. Draw a square inch.

6. Draw a square  $\frac{1}{2}$ -inch.

7. Draw a square 2-inches.

## CLASS WORK.

1. *Review all the points so far studied.*

2. *Let pupils measure :*

(1) *By inches to 5 in.*

(2) *By feet to 5 ft.*

(3) *By yards to 5 yds..*

3. *Let pupils measure liquids : by the pint, by the half-pint, by the quart, by the gallon.*

4. *Let pupils measure grain : by the peck, by the bushel.*

5. *Let them divide given objects into halves, into thirds, into fourths, into fifths.*

## SEAT WORK.

Write carefully : inches, feet, yards ; pints, quarts, gallons ; pecks, bushels ; cents, dollars.

Memorize :

$$2 \times 1 = 2.$$

$$2 \times 2 = 4.$$

$$3 \times 1 = 3.$$

$$4 \times 1 = 4.$$

$$5 \times 1 = 5.$$

$$2 + 1 = 3.$$

$$3 + 1 = 4.$$

$$2 + 2 = 4.$$

$$3 + 2 = 5.$$

$$2 + 3 = 5.$$

$$4 + 1 = 5.$$

## OTHER THINGS TAUGHT IN THIS STEP.

*Teach the pupils to count to 10, or even to 100.*

*Teach them to write figures to 10.*

*To read numbers to 10.*

*To measure things in the room.*

*To have a conception of length and capacity, judging by sight alone : For example, to distinguish things about an inch, a foot, or a yard long ; or to estimate the size of a vessel, whether it will hold a half-pint, a pint, a quart, or a gallon ; or to estimate the quantity of grain in a pile, whether it is a peck, a half-peck, a half-bushel, or a bushel.*

*Require pupils to write all the figures neatly and distinctly.*

*Let them ask questions of each other, and do not discourage inquiry, even though some questions should involve much higher numbers than the number 5.*

# THE INDUSTRIAL ARITHMETIC.



*STEP THE SECOND.*

SIX TO TEN.





## STEP THE SECOND.



### THINGS ALREADY LEARNED.

The *Numbers* One to Five, — all possible combinations.

The *Signs* +, −, =, ×, and )     .

The *Triangle*, and how to draw it.

The *Square*, and how to draw it.

The idea of one-half, one-third, one-fourth, and one-fifth.

How to write  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ , and  $\frac{1}{5}$ .

Two pints in one quart.

How to measure two pints, etc.

Four quarts in one gallon.

How to measure four quarts, etc.

The idea of an inch, a foot, a yard.

Three feet in one yard.

How to measure things 1 in., 2 in., 3 in., 4 in., 5 in. long.

How to measure things 1 ft., 2 ft., . . . , 5 ft. long.

How to measure things 1 yd. long.

One pint is  $\frac{1}{2}$  quart.

One quart is  $\frac{1}{4}$  gallon.

One foot is  $\frac{1}{3}$  yard.

How to draw triangles and squares of given dimensions.

How to draw a square one inch on each side ; two inches on each side. The names of such squares.

How to draw a square half-inch, etc.

Pieces of money: one cent, two cents, three cents, five cents;  
one dollar, two dollars, five dollars.

How to divide lines into a given number of parts.

Postage-stamps, — 1-ct. and 2-ct., — and their use. Also 3-ct.,  
4-ct., and 5-ct. stamps.

How to buy, sell, and make change, — no transaction to involve  
more than 5 cents.

---

*NOTE TO TEACHER. Be sure that your pupils understand most  
of the things above enumerated before proceeding with the lessons  
in the Second Step. Observe what has already been said about  
“processes.”*

## THE NUMBERS SIX AND SEVEN.

## CLASS WORK.

1. Count six.
2. Clap your hands six times.
3. Take six steps forwards.
4. Take six steps backwards.
5. Count six backwards.
6. Count to six by twos, beginning with 2.
7. Count backwards by twos, beginning with six.
8. Six is how much more than 3? 5? 2? 4? 1?
9. Four is how much less than 6?
10. Three is how much less than 6?
11. Two is how much less than 6?
12. Six is twice what number?

*Illustrate by means of objects.*

13. Write the figure 6.
14. Draw a line about 6 inches long.
15. Find some objects which have six sides.
16. Draw a figure which has six angles or six corners.
17. Write the names of six objects.

## SEAT WORK.

1. Copy the following words, and write the figure corresponding to each :

*One, Two, Three,*  
*Four, Five, Six.*

2. Copy, and fill blanks :

$$6 = 3 +$$

$$6 = 5 +$$

$$6 = 2 +$$

$$6 = 4 +$$

$$6 = 1 +$$

$$4 = 6 -$$

$$6 = 2 \times$$

$$6 = 3 \times$$

3. Find 6 sticks, each one inch long.
4. Find 1 stick as long as these 6 sticks taken together.
5. Find 2 sticks which taken together are equal to the same.
6. Find 3 sticks which taken together are equal to the same.
7. How many triangles can you make with 6 short sticks?
8. How many squares? Try it, and see.
9. Draw a six-sided figure.
10. Divide it into triangles.

## CLASS WORK.

1. Count seven.
2. Clap your hands seven times.
3. Take seven steps forwards.
4. Take seven steps backwards.
5. Count seven backwards.
6. Count to seven by twos, beginning with 1, thus: One, three, etc.
7. Count backwards by twos, beginning with seven, thus: Seven, five, etc.
8. Seven is how much more than 6? 3? 1? 5? 2? 4?
9. Three is how much less than seven?
10. One is how much less than 7?
11. Five is how much less than 7?
12. Seven is five more than what number?
13. Draw a line about 7 inches long.
14. What two numbers added together make 7?

*Illustrate, by means of objects, etc., all of the above.*

## SEAT WORK.

1. Copy these words:  
*Seven, Six, Five.*
2. Copy, and fill the blanks:
 

$7 = 6 +$
$7 = 3 +$
$7 = 5 +$
$7 = 1 +$
$7 = 4 +$
$7 = 2 +$
$6 = 7 -$
$2 = 7 -$
$3 = 7 -$
$4 = 7 -$
$5 = 7 -$
$1 = 7 -$
3. Find seven sticks, each 1 inch long.
4. Find as many different pairs of sticks as you can which together are equal in length to the combined length of the seven 1-inch sticks.  
(*Hint.* One pair consists of two sticks, one of which is 6 inches long, the other 1 inch.)
5. Draw a line seven inches long.
6. Make seven marks on your foot ruler, one inch apart.

## CLASS WORK.

1. What three different numbers added together make 6?

2. What three make 7?

3. Write them down, thus:

$$1 + 2 + 3 = 6.$$

$$1 + 2 + 4 = 7.$$

4. There are 6 girls in a certain class, and 7 boys. How many more girls than boys?

5. John has 7 cents. Henry and Anna have together 6 cents, half of which belongs to each. How much more has John than Henry?

6. Frank buys 6 apples at 1 cent each; what do all cost?

7. He sells his apples for 7 cents; what is his gain?

8. If he had sold them for 3 cents, how much would he have lost?

9. Divide 6 apples equally between two boys.

10. Divide 7 apples equally between two boys.

11. Divide 6 apples equally among three girls.

12. Mary is 7 years old, and Lulu is 3. How much older is Mary than Lulu?

## SEAT WORK.

1. Draw 6 lines on your slates, each 6 inches long. Distinguish each by letters, *AB*, *CD*, *EF*, etc.

2. Divide the line *AB* into 2 equal parts.

3. Divide the line *CD* into 3 equal parts.

4. Divide the line *EF* into 6 equal parts.

5. Make the line *GH* one inch longer.

6. Copy the following, and fill the blanks:

$$\frac{1}{2} \text{ of } 6 \text{ in.} = \text{ in.}$$

$$\frac{1}{3} \text{ of } 6 \text{ in.} = \text{ in.}$$

$$\frac{1}{4} \text{ of } 6 \text{ in.} = \text{ in.}$$

$$6 \text{ in.} + 1 \text{ in.} = \text{ in.}$$

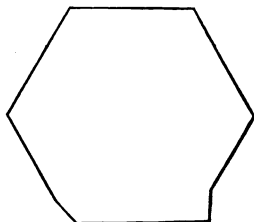
$$3 \text{ ft.} + 3 \text{ ft.} = \text{ ft.}$$

$$3 \text{ ft.} + 4 \text{ ft.} = \text{ ft.}$$

$$5 \text{ ft.} + \text{ ft.} = 7 \text{ ft.}$$

$$2 \text{ ft.} + \text{ ft.} = 6 \text{ ft.}$$

7. With 6 short sticks make a figure like this:



## CLASS WORK.

*Let the pupils "keep store." No transaction should involve numbers higher than seven.*

1. Ella buys 2 yards of ribbon for 3 cents a yard. What does she pay for it?

2. She pays for it with two pieces of money, not alike. What are the pieces?

3. She cuts the ribbon in the middle. How long is each part?

4. She sells one piece to Mary for 4 cents. What does she gain on that piece?

5. Mary gives her one piece of money. What is it?

6. How much change must she give to Mary?

7. She sells the other piece to Alice for 1 cent. How much does she lose on this piece? How much money has Ella now?

8. Henry buys 7 marbles, at 1 cent each. What do they all cost? With what two pieces of money might he pay for them?

*These are only samples of the questions which may be asked in connection with this work.*

## SEAT WORK.

Copy, and fill the blanks :

$$3 \times 2 \text{ cts.} =$$

$$3 \text{ cts.} + 2 \text{ cts.} + 2 \text{ cts.} =$$

$$2) 6 \text{ cts.}$$

$$5 \text{ cts.} + 1 \text{ ct.} = \text{ cts.}$$

$$2) 2 \text{ yds.}$$

$$4 \text{ cts.} = 3 \text{ cts.} +$$

$$5 \text{ cts.} = 4 \text{ cts.} +$$

$$5 \text{ cts.} - 4 \text{ cts.} =$$

$$1 \text{ yd.} = \text{ ft.}$$

$$2 \text{ yd.} = \text{ ft.}$$

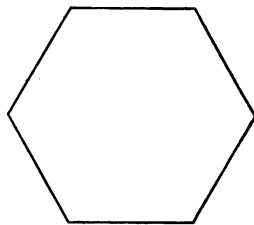
$$7 \text{ ft.} = 2 \text{ yd.} + \text{ ft.}$$

$$6 \text{ ft.} = \text{ yd.}$$

$$5 \text{ ft.} = \text{ yd.} + \text{ ft.}$$

$$4 \text{ ft.} = \text{ yd.} + \text{ ft.}$$

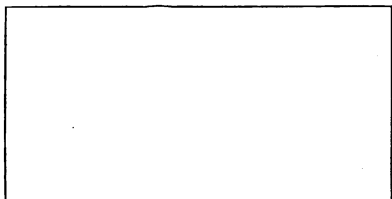
Draw a figure of 6 sides like this, making each side one inch long :



Draw lines from each corner to the point in the centre. How many triangles have you made?

## CLASS WORK.

1. Draw a square one-inch.
2. Draw two lines one inch apart and two inches long, thus,



3. Draw another figure like this, but of a different length and width.

4. Measure this other figure, and tell me how long and how wide it is.

5. We call such a figure an Oblong.

6. If all the angles are *right* angles, we call it a **Rectangle**.

A square is also a rectangle.

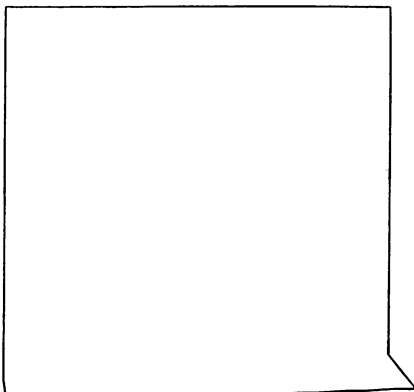
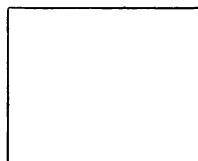
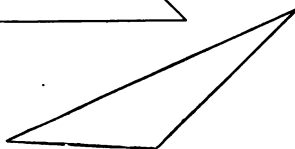
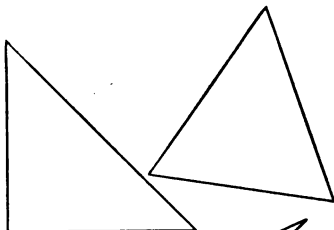
7. Draw on the blackboard (or floor) a rectangle 1 foot wide and 1 yard long.

*Review Lesson XLVI., Step First, especially that part of the pupils' work relating to triangles.*

*Do not forget to continue the exercises in buying, selling, and making change. See page 43, Step First.*

## SEAT WORK.

Draw these figures, and write the name of each below it :



## CLASS WORK.

1. Learn this :  
*Seven Days in One Week.*
2. Write the names of the days of the week.
3. How many school-days in a week ?
4. How many days from Monday to Friday ? (Both days named are always included.)
5. If a man earn one dollar a day, how much will he earn in a week ? How many work-days are there in a week ?

6. John missed school three days last week ; how many days was he present ?

*Make up many other questions similar to these.*

7. How many quarts in 2 pints ? 6 pints ?

8. Six quarts is how much more than one gallon ?

9. How many quarts in 1 gallon and 1 quart ?

*Let pupils make actual measurements, and compare the results with the above.*

*Require them to write the results in each case, as :*

*6 pts. = 3 qts. or 3 qts. = 6 pts.*

## SEAT WORK.

1. Copy this :

**One Week.**

1 Sunday.  
2 Monday.  
3 Tuesday.  
4 Wednesday.  
5 Thursday.  
6 Friday.  
7 Saturday.

Seven Days in One Week.

Tues. = Tuesday.

Sat. =

Sun. =

Mon. =

Wed. =

Thurs. =

Fri. =

2. Memorize this :

$$2 \times 1 = 2.$$

$$2 \times 2 = 4.$$

$$2 \times 3 = 6.$$

$$3 \times 1 = 3.$$

$$3 \times 2 = 6.$$

3. Copy, and fill the blanks :

$\frac{1}{2}$  of 2 pts. =      pts.



## CLASS WORK.

*Show the children a peck measure, a dry quart, a half-bushel.*

1. Four pecks = what?
2. Two pecks is what part of a bushel?
3. Five pecks are how much more than one bushel?
4. How many bushels in six pecks?
5. How many pecks in half a bushel?
6. If 1 bushel of sweet potatoes cost two dollars, what will  $\frac{1}{2}$  bushel cost?
7. At 4 dollars a bushel, what will one peck of grass-seed cost?
8. What will 3 pecks cost at the same rate?
9. How many half bushels in 1 bushel? in 2 bushels? in 3 bushels?
10. How many bushels in 4 pecks? in 7 pecks?

*Make up other questions like these. Let the children measure.*

*Combine exercises in dry measure with lessons in buying, selling, and making change.*

*Study variety, and do not allow the interest of the children to flag.*

## SEAT WORK.

1. Copy these words:

*Angle.*

*Triangle.*

*Square.*

*Right Triangle.*

*Acute Triangle.*

*Obtuse Triangle.*

*Rectangle.*

*Oblong.*

2. Write the names of things sold by the peck or bushel.

3. Copy, and fill the blanks:

$$1 \text{ bus.} = \text{pk.}$$

$$6 \text{ pk.} = \text{bus.}$$

$$1 \text{ pk.} = \text{bus.}$$

$$2 \text{ pk.} = \text{bus.}$$

$$3 \text{ pk.} = \text{bus.}$$

$$1 \text{ bus.} + 2 \text{ pk.} = \text{pk.}$$

$$\frac{1}{2} \text{ of } 1 \text{ bus.} = \text{pk.}$$

$$7 \text{ pk.} = 1 \text{ bus.} + \text{pk.}$$

$$3) 6 \text{ pk.}$$

$$2 \times 2 \text{ pk.} = \text{pk.}$$

$$2 \times 2 \text{ pk.} = \text{bus.}$$

**CLASS WORK.****Liquid Measure.**

1. If 1 gallon of sour milk is sold for four cents, how much is 1 quart sold for?

2. A milkman sold one gallon of milk to one man, one-half gallon to another, and a quart to another. How many quarts did he sell to the three men?

*Let the children measure, buy, and sell. Continue for two or three days on exercises like the above. Review angles, triangles, squares, and rectangles.*

**Miscellaneous Questions.**

3. Susan has 2 cents, and Emma has three times as much. How much money has Emma?

4. If Emma gives Susan two cents, and John two cents, how much has she left?

5. How much now has Susan?

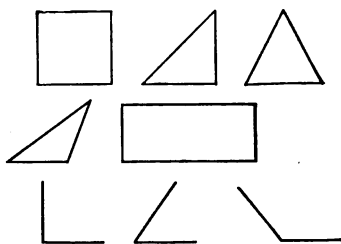
6. Henry has four pieces of money, all of which taken together make 7 cents. What are the pieces?

7. If a man can plough 2 acres in one day, how much can he plow in 3 days?

**SEAT WORK.**

1. Draw two straight lines, each six inches long, taking care to make them the same distance apart at every point.

2. Make exact copies of the following figures, and write the name of each:



3. Write the abbreviations used for each of the following expressions:

Cent =	Gallon =
Dollar =	Peck =
Pint =	Bushel =
Quart =	

4. Copy, and fill the blanks:

$$6 \text{ cts.} = 2 \times \text{ cts.}$$

$$7 \text{ cts.} = 2 +$$

$$\frac{1}{2} \text{ of } 6 \text{ cts.} =$$

$$2 + 2 + 1 + 2 =$$

$$7 \text{ cts.} - 2 \text{ cts.} =$$

$$5 \text{ cts.} = 2 \text{ cts.} +$$

$$\frac{1}{3} \text{ of } 6 = \quad \frac{1}{3} \text{ of } 6 =$$

## THE NUMBER EIGHT.

## CLASS WORK.

1. Count eight.
2. Clap your hands eight times.
3. Take eight steps forward ; backward.
4. Count eight by twos, beginning with 2.
5. Count backward from 8 by twos.
6. Take 8 sticks, each 1 inch long.
7. Draw a line as long as these 8 sticks taken together.
8. Put 8 blocks in a row.
9. Let 8 boys stand up.
10. Make 8 marks on the blackboard.

*Show the pupils the best way to make the figure 8.*

11. How many sides do two squares have? How many corners?

12. How many sides has a square block?

13. How many corners?

14. What two numbers added together make 8? What three numbers? What four numbers?

15.  $8 =$  how many 2's?

## SEAT WORK.

1. Write the word

*Eight.*

2. Write eight lines of figure 8's.

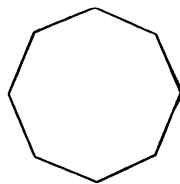
3. Draw two squares on your slates.

4. How many corners have the two squares?

5. Draw eight straight lines, each one inch long.

6. Draw eight small triangles on your slates, writing the name of each beneath it.

7. With inch sticks form an eight-sided figure like this :



8. How many squares can you form from the same number of sticks?

9. How many triangles? Try it, and see.

10.  $8 = 3 + 3 +$

## CLASS WORK.

1.  $1+1+1+1+1+1+1+1$   
= how many ?

2. Anna had 3 apples, and her brother gave her 5 more. How many had she then ?

3. If a slate cost 7 cents, and a sponge cost 1 cent, what do both cost ?

4. A milkman sold 2 quarts of milk to one man, 1 quart to another, and 3 quarts to another. How much did he sell to all ?

5. Eight is how many more than 5 ? than 3 ? than 1 ? than 4 ? than 6 ?

6. Edward wishes to buy a book which costs 8 cents ? He has now a 3-cent piece and a 2-cent piece. How much does he lack of having enough to buy the book ?

7. Eight cents will buy how many pears, at 2 cents each ?

8. How many legs have 2 birds ?

9. How many legs have 2 dogs ?

10. How many more legs have 2 dogs than 2 birds ?

## SEAT WORK.

1. Copy, and fill the blanks:

$$3 + 5 =$$

$$7 + \quad = 8.$$

$$\quad + 2 = 8.$$

$$2 + 2 + \quad = 8.$$

$$3 + 2 + \quad = 8.$$

$$4 + 2 + \quad = 8.$$

$$8 = 2 + 4 + 1 +$$

$$8 = 3 + 3 +$$

$$8 = 4 +$$

$$8 = 2 + 1 +$$

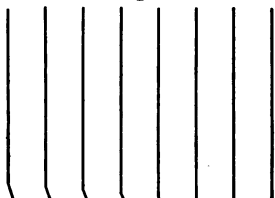
2. Write five questions like those in the first column of this page.

3. Draw a square inch.

4. Draw eight square inches in a row, all joined together.

5. Erase the lines between them. What kind of a figure have you now ? Write its name. Write the number of square inches in it.

6. Draw eight straight lines, each 1 inch long, as below :



## CLASS WORK.

1. A man having two bushels of wheat wished to sell it by the peck. How many peck measures would it fill?

2. Seven pecks are how much more than one bushel? How much less than 2 bushels?

3. William bought one bushel of clover-seed, at the rate of 1 dollar a peck. How much did he pay for the bushel?

4. If the price had been 2 dollars a peck, what would the bushel have cost?

5. How many half bushels in 4 pecks?

6. How many half bushels in 8 pecks?

7. How many bushels in 8 pecks?

We will now learn something else:

Eight Quarts = One Peck.

*Let the children measure.*

*Continue exercises like the above for two or three days.*

8. At 2 dollars a bushel, what will four bushels of popcorn cost? What will 1 peck cost at the same rate?

## SEAT WORK.

1. Write this:

*Eight Quarts =  
One Peck.*

2. Write this:

$$8 \text{ qt.} = 1 \text{ pk.}$$

$$1 \text{ pk.} = 8 \text{ qt.}$$

3. Copy, and fill the blanks:

$$4 \text{ pk.} = \text{ bu.}$$

$$\text{ pk.} = 2 \text{ bu.}$$

$$2 \text{ pk.} = \text{ bu.}$$

$$1 \text{ pk.} = \text{ bu.}$$

$$6 \text{ pk.} = \text{ bu.}$$

$$\text{ qt.} = 1 \text{ pk.}$$

$$4 \text{ qt.} = \text{ pk.}$$

$$2 \text{ qt.} = \text{ pk.}$$

$$1 \text{ pk.} = \text{ qt.}$$

$$\frac{1}{2} \text{ pk.} = \text{ qt.}$$

4. Copy, and fill the blanks:

$$8 \text{ pk.} - 4 \text{ pk.} = \text{ pk.}$$

$$2 \text{ bu.} - 1 \text{ bu.} = \text{ bu.}$$

$$8 \text{ qt.} - 2 \text{ qt.} = \text{ qt.}$$

$$2 \text{ bu.} = \text{ pk.}$$

5. Copy, and fill the blanks:

$$2 \times 3 =$$

$$2 \times 4 =$$

$$3 \times 2 =$$

$$4 \times 2 =$$

## CLASS WORK.

1. Draw a line on the black-board two yards long.
2. Draw another line eight feet long.
3. How much longer is the second line than the first?
4. Draw another line one yard long.
5. Eight feet is how much more than two yards? than one yard?
6. Cut a string 8 feet long. Divide it into 2 equal parts. How long is each part?
7. Divide a string which is  $\frac{1}{2}$  of 8 feet long into 2 equal parts. How long is each part?
8. Draw a line 5 feet long. Draw another 8 feet long. How much longer is the second than the first?
9. From a line 8 feet long cut 2 yards.
10. From a line 2 yards long cut 4 feet.
11. Make eight marks 1 inch apart on your foot rulers.
12. How many inches from one end of the ruler to its *middle*?

## SEAT WORK.

1. Draw two lines, each 8 inches long.
  2. Draw 8 squares, each one inch square.
  3. Draw one square eight inches.
  4. Make all the above squares with sticks.
  5. Draw a rectangle eight inches long and one inch wide.
  6. Make a rectangle the same size as above with sticks.
  7. Divide a line 8 inches long into 2 equal parts.
  8.  $\frac{1}{2}$  of 8 in. = in.
  9. Divide a line 8 inches long into 4 equal parts.
  10.  $\frac{1}{4}$  of 8 in. = in.
  11. Divide this line into eight equal parts:
- 
12. Write the following:
- pt. means pint or pints.  
 qt. means quart or quarts.  
 pk. means peck or pecks.  
 bu. means bushel or bushels.  
 gal. means gallon or gallons.  
 yd. means yard or yards.  
 ft. means foot or feet.  
 in. means inch or inches.

## CLASS WORK.

*Show that  $\frac{1}{2}$  of 8 = 1.*

*Let the pupils draw on the blackboard or the floor a rectangle 2 yd. long and 1 yd. wide.*

*Show how this contains 2 square yards.*

*Let them draw a rectangle 8 ft. long and 1 yd. wide.*

*Show that this contains more than 2 square yards. How much?*

*Show that the remaining part is 2 ft. wide by 1 yd. long.*

*Show that this part contains 6 square feet.*

*N.B. If the above work is thought too difficult, approach it by giving easier lessons embodying the same principles, or postpone until later.*

## Review.

*Ask questions reviewing the principles already taught.*

*Let the children ask questions.*

*Let the children buy, sell, and make change,—results not to exceed 8 cents or 8 dollars.*

*Let the children measure to 8 feet; to 2 bushels; to 8 quarts.*

*Review  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{1}{16}$ .*

## SEAT WORK.

1. Cut a strip of paper 8 inches long and 1 inch wide.

2. Cut another strip the same size.

3. Divide one of these strips into 8 equal parts. What is the size of each part?

4. Draw 8 triangles of different sizes.

5. With 8 sticks, each 1 inch long, make an 8-sided figure.

6. How many squares can you make with 8 sticks? Try.

7. How many triangles can you make with 8 sticks? Try.

8. Copy, and fill the blanks:

$$8 \overline{) 8}$$

$$\frac{1}{2} \text{ of } 8 =$$

$$\frac{1}{4} \text{ of } 8 =$$

$$\frac{1}{8} \text{ of } 8 =$$

$$\frac{1}{16} \text{ of } 8 =$$

## Review.

9. Copy, and fill the blanks:

$$2 \times 3 =$$

$$2 \times 4 =$$

$$\frac{1}{2} \text{ of } 8 =$$

$$3 + 2 + \quad = 8.$$

$$8 - 3 =$$

$$8 - 2 - 2 - 2 =$$

## CLASS WORK.

1. How many days in one week? In one week and one day?

2. If a man earn one dollar a day, how much will he earn in one week and one day?

3. If you get one merit each school-day, how many merits will you get in one week and one day?

4. How many work-days in a week? How many school-days?

5. If a man walk 2 miles every day for 4 days, how many miles does he walk?

6. I have 4 pieces of money which together equal 8 cents. What are the pieces?

*Answer may be "four 2-cent pieces," or "a 5-cent piece and three 1-cent pieces."*

7. What cost 4 yards of ribbon, at 2 cents a yard?

8. Mary had 2 pieces of money which together were equal to 8 cents. What were they?

*Ask more questions of this sort.*

## SEAT WORK.

1. Write the names of eight days in succession, beginning with to-day.

2. Mark the school-days with a star, thus: \*Monday.

3. Mark the work-days with a cross, thus: Saturday.<sup>+</sup>

4. Copy, and fill the blanks:

7 da. = wk.

8 da. = wk. + da.

1 wk. = 5 da. + da.

$\frac{1}{2}$  of 7 da. = da.

$\frac{1}{2}$  of 1 wk. = da.

5. Copy these, and write in full the word for which each stands:

in. =                      pk. =

ft. =                      bu. =

yd. =                      ct. =

pt. =                      da. =

qt. =                      wk. =

gal. =

6. Copy this, and remember it:

\$ = dollar.

\$ = dollars.

ct. = cent.

da. = day or days.

wk. = week or weeks.



## CLASS WORK.

1. A grocer sold 6 quarts of vinegar to one man, and 2 quarts to another. How much did he sell to both?

2. How many gallons are 8 quarts?

3. How many gallons did he sell to the first man?

4. How many to the second?

5.  $1\frac{1}{2} + \frac{1}{2}$  = how many?

6. In 8 pints of milk how many quarts?

7. In 8 pints of cider how many gallons?

8. 1 gal. = how many pts.?

9. What cost  $\frac{1}{2}$  gallon of buttermilk, at 4 cents a quart?

10. How many pints in 1 quart? in 1 gallon? in  $\frac{1}{2}$  gallon?

11. How many quarts in  $\frac{1}{4}$  gallon? in  $\frac{1}{2}$  gallon?

12. One pint is what part of a quart? what part of a gallon?

*Make up many other questions and exercises like the above.*

*Let the children learn by much actual measuring.*

*Compare liquid measure with dry measure.*

## SEAT WORK.

1. Copy the following:

*Liquid Measure.*  
*Pint. Quart. Gallon.*  
*2 Pints = 1 Quart.*  
*4 Quarts = 1 Gallon.*

$$2 \text{ pt.} = 1 \text{ qt.}$$

$$4 \text{ qt.} = 1 \text{ gal.}$$

2. Copy the following, and fill the blanks:

$$6 \text{ qt.} + 2 \text{ qt.} = \text{gal.}$$

$$8 \text{ qt.} = \text{gal.}$$

$$4 \text{ qt.} + 2 \text{ qt.} = \text{qt.}$$

$$6 \text{ qt.} = \text{gal.}$$

$$2 \text{ qt.} = \text{gal.}$$

$$1\frac{1}{2} \text{ gal.} + \frac{1}{2} \text{ gal.} = \text{gal.}$$

$$2 \text{ pt.} = \text{qt.}$$

$$8 \text{ pt.} = \text{qt.}$$

$$8 \text{ pt.} = \text{gal.}$$

$$\frac{1}{2} \text{ gal.} = \text{qt.}$$

$$1 \text{ pt.} = \text{qt.}$$

$$1 \text{ pt.} = \text{gal.}$$

$$2 \text{ pt.} = \text{gal.}$$

$$4 \text{ pt.} = \text{gal.}$$

$$8 \text{ pt.} = \text{gal.}$$

$$5 \text{ qt.} = \text{qt.}$$

## CLASS WORK.

1. What is the largest piece of money you can have if you have but 8 cents?

2. Fred had 8 cents, and gave 3 cents to a beggar. How much had he left?

3. With what he had left he bought a pencil, a sponge, and a pen. The pencil cost 2 cents, and the pen 1 cent; what did the sponge cost?

4. If 8 dry quarts make a peck, how many dry quarts make  $\frac{1}{2}$  a peck?

5. From a vessel holding 7 quarts take 3 quarts. What is left?

6. How many fingers have you on one hand? on both hands?

7.  $2 \times 4$  fingers = fingers.

8. How many more fingers have you than thumbs?

9. How many 2-cent stamps can be bought for 8 cents? How many 3-cent stamps?

*Make up many more questions like these.*

10. Make eight marks, one inch apart, on your foot-rulers.

## SEAT WORK.

1. Write five questions of your own composing like those in the first column.

2. Copy, and fill the blanks:

$$8 \text{ cts.} - 3 \text{ cts.} = \text{ cts.}$$

$$5 - 2 - 1 =$$

$$8 = 4 +$$

$$8 = 2 \times$$

$$\frac{1}{2} \text{ of } 8 \text{ qt.} = \text{ qt.}$$

$$\frac{1}{2} \text{ of } 8 \text{ qt.} = \text{ pk.}$$

3. Count to 8 by twos, thus:

$$2, 4, \quad , \quad .$$

4. Count backward from 8 by twos.

$$5. \quad 8 - 2 - 2 - 2 =$$

$$2 + 2 + 2 + 2 =$$

$$8 - 3 - 2 - 2 =$$

$$3 + 3 + 1 =$$

$$1 + 3 + 3 =$$

$$2 + 4 + \quad = 8.$$

$$8 - 6 + \quad = 5.$$

$$3 + 5 - \quad = 4.$$

6. Draw a rectangle 4 inches long and 1 inch wide. Divide it into 4 equal parts. What is each part?

7. Divide each of the squares into 2 equal parts. How many small rectangles have you now?

## CLASS WORK.

## Dry Measure.

1. Here is 1 pk. of beans. How many quart measures can you fill from it?

2. Two pk. of beans are what part of a bushel?

3. Frank bought  $\frac{1}{2}$  bushel of oranges for 4 dol. How much would 1 bushel cost at the same rate?

4. How much would 1 pk. cost?

5.  $\frac{1}{4}$  of 4 pk. } Which is the  
 $\frac{1}{4}$  of 1 bu. } greater?

6. What cost 2 quarts of shelled peas, at 4 cents a quart?

7. John buys 2 qts. of nuts at one time, 2 qts. at another, and 4 qts. at another. How much does he buy altogether?

8. How many pints in a quart? How many quarts in a peck?

*Ask many more questions like these, and let the children measure.*

9. How many pints in 4 quarts? in 3 quarts?

10. At 8 dollars a bushel, what will 1 pk. of grass-seed cost?

## SEAT WORK.

## Dry Measure.

1. Copy the following:

*Dry Measure.*  
*Quart Peck.*  
*Bushel.*

*8 Quarts = 1 Peck.*  
*4 Pecks = 1 Bushel.*

8 qt. = 1 pk.

4 pk. = 1 bu.

2. Write five questions like those in the first column, and give the answer to each.

3. Memorize:

$$2 + 2 = 4.$$

$$2 + 4 = 6.$$

$$2 + 6 = 8.$$

$$3 + 1 = 4.$$

$$3 + 3 = 6.$$

$$3 + 5 = 8.$$

$$4 + 1 = 5.$$

$$4 + 3 = 7.$$

4. Be sure that you remember this:

2 pints = 1 quart.

4 quarts = 1 gallon.

8 quarts = 1 peck.

## CLASS WORK.

**Measuring.**

1. Measure a line eight feet long.

2. Measure a line 8 yards long.

3. Draw lines on the floor or blackboard to represent a flower-bed 8 ft. long and 1 ft. wide.

4. How many square feet are contained in this flower-bed?

5. Draw lines on the floor to represent 1 sq. yard.

6. Draw lines on the floor to represent a strip of carpet 3 yds. long and 1 yd. wide.

7. How many square yards are contained in this carpet?

8. Draw a rectangle 2 feet wide and 3 feet long.

9. Divide this rectangle into square feet.

10. How many square feet in a board 6 feet long and 1 foot wide? How many in a board 4 feet long and 1 foot wide? 4 feet long and 2 feet wide?

*Ask other questions and give other exercises similar to the above. Have the children measure.*

## SEAT WORK.

**Measuring.**

1. Draw a line eight inches long, and divide it into 8 equal parts.

2. Draw three other lines, each 8 inches long, calling them  $AB$ ,  $CD$ , and  $EF$ .

3. Divide  $AB$  into four equal parts.

4. Divide  $CD$  into 2 equal parts.

5. From  $EF$  erase  $\frac{1}{4}$  of its length.

6. Draw a rectangle eight inches long and one inch wide.

7. Into how many square inches can you divide this rectangle?

8. Draw a rectangle 4 in. long and 2 in. wide.

9. Into how many square inches can this last rectangle be divided?

10. Cut a strip of paper the size of the rectangle last drawn.

11. Cut it into square 2-inches.

12. Now cut the square 2-inches into square inches. Cut the squares into triangles.

## CLASS WORK.

## Miscellaneous.

1. If you can step two feet at each step, how many steps must you take to walk eight feet?

2. If you sell 1 gallon of milk to one man, and 3 quarts to another, how many quarts do you sell to both?

3. If 2 bushels of grass-seed cost 8 dollars, what does 1 bus. cost?  $\frac{1}{2}$  bushel? 1 peck?

4. If John has 8 cents, and Edward has half as much, how much money has Edward?

5. If Frank has a 1-cent piece and a 3-cent piece, and Tom has half as much, how much money has Tom?

6. How much money have Frank and Tom together?

7. Mary is 4 years old, and Anne is twice as old as Mary. How old is Anne?

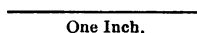
8. If 4 yards of ribbon cost 8 cents, how much does 1 yard cost? How much can you buy for 6 cents?

*Make up more questions of the same kind.*

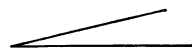
## SEAT WORK.

## Measuring.

1. Draw a line of any length not more than 8 inches. Measure it, and write its length beneath it, thus:

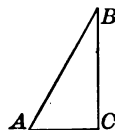


2. Draw two such lines meeting each other at a point, thus:



3. Draw a triangle, making each of two sides four inches long.

4. Measure the distance from *A* to *C* on the straight line *AC*.



5. Measure the distance from *A* to *C* by way of *B*.

6. Draw three kinds of triangles.

7. Draw a square 2-inches.

8. Divide the square 2-inches you have drawn into square inches.

9. Find how many square half-inches in a square inch.

## CLASS WORK.

*Teach what is meant by a horizontal line.*

*Teach what is meant by a vertical line.*

*Teach what is meant by slanting lines.*

*Let the children find vertical lines about the room.*

*Let them find horizontal lines.*

*Let them find slanting lines.*

*Teach what is meant by parallel lines.*

*Let them find parallel lines in the room.*

*State no formal definitions, but give such exercises as will enable children to name at sight the different kinds of lines.*

*Teach how to draw a number of parallel lines; a number of parallel vertical lines; a number of parallel horizontal lines.*

*Continue several days with such instruction and exercises.*

*Vary these exercises with practical work on slates and black-board, also with measuring, etc.*

## SEAT WORK.

1. Copy, and draw examples of each kind of line :

*Horizontal Line.*

*Vertical Line.*

*Parallel Lines.*

2. Copy, and fill the blanks :

$$4 + 4 =$$

$$2 \times 4 =$$

$$(2 \times 4) - 3 =$$

$$\frac{1}{2} \text{ of } 8 =$$

$$6 \text{ ft.} = \text{ yd.}$$

$$8 \text{ ft.} = \text{ yd.} + \text{ ft.}$$

$$5 \text{ ft.} = \text{ yd.} + \text{ ft.}$$

$$8 \text{ ft.} - 5 \text{ ft.} =$$

3. Remember :

$$2 \times 1 = 2.$$

$$4 \times 1 = 4.$$

$$2 \times 2 = 4.$$

$$4 \times 2 = 8.$$

$$2 \times 3 = 6.$$

$$\frac{1}{2} \text{ of } 8 = 4.$$

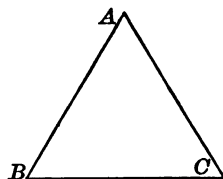
$$3 \times 1 = 3.$$

$$\frac{1}{4} \text{ of } 8 = 2.$$

$$3 \times 2 = 6.$$

$$\frac{1}{8} \text{ of } 8 = 1.$$

4. Draw this figure :



## CLASS WORK.

## Columns.

*Teach what is meant by a column of figures.*

*Give pupils practice in writing long columns of figures.*

*Teach what is meant by a line of figures.*

*Require columns and lines to be written with great care. Columns of figures should be vertical and parallel; lines should be horizontal and parallel.*

*You cannot pay too much attention to neatness of work and accuracy.*

*Continue the above work until the pupils comprehend clearly.*

1. If John earns 2 dollars a day, how much does he earn in  $\frac{1}{2}$  day? in 3 days? in  $3\frac{1}{2}$  days?

2. What do 3 marbles cost, if 4 cost 8 cents?

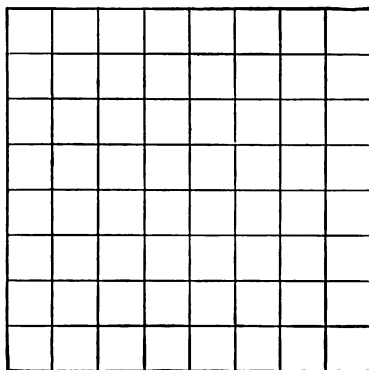
3. Anne gave 5 cents for a pencil, and had 3 cents left. How much had she at first?

4. If I walk 1 mile every day, how many miles do I walk in a week?

5. Write a long column of figures; a long line:

## SEAT WORK.

1. Draw a number of squares, as below, so that, counted either horizontally or vertically, there are eight in a line:



2. Write a figure in each square.

3. Draw eight parallel horizontal lines, each four inches long. Be careful to draw them just half an inch apart.

4. Draw, also half an inch apart, eight parallel vertical lines, each four inches long, and crossing the horizontal lines just drawn. Fill each square, thus formed, with a letter.

5. Write eight columns of figures, each column containing eight figures.

## CLASS WORK.

*Teach what is meant by the word add.*

*Give examples in which pupils are required to add.*

*But do not yet define Addition.*

$$2 + 1 + 2 + 3 =$$

This is one way of writing numbers to be added. I will show you another way, which is more common. Write the figures in a column, thus :

Write the answer below  
the short horizontal line.

*Teach what is meant by the word multiply.*

*Give examples in which pupils are required to multiply.*

*But do not yet define Multiplication.*

$$2 \times 4 =$$

This is one way of writing numbers to be multiplied. I will show you another way :

Multiply the upper number by the lower, and write the answer under the short horizontal line.

*NOTE. This work should occupy the time of several lessons.*

## SEAT WORK.

1. Add the figures in each of the following columns :

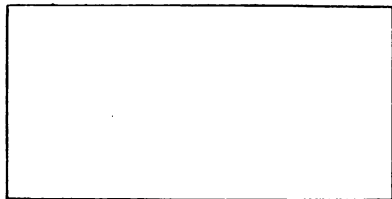
1	2		1	
2	2		1	2
1	2	4	3	1
2	1	1	1	2
<u>1</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>2</u>

2. Write columns of figures which added together make 8; but have no two columns alike. See how many different columns you can make; each column may contain from three to eight figures,

3. Multiply the upper figure by the lower :

2	1	4	2	3
<u>2</u>	<u>3</u>	<u>2</u>	<u>4</u>	<u>2</u>

4. Divide this rectangle into eight squares.



*NOTE. Divide it first into two squares, then each of these squares into two equal rectangles.*



## THE NUMBER NINE.

## CLASS WORK.

1. Count nine.
2. Clap your hands 9 times.
3. Take 9 steps forward ; 9 steps backward.
4. Lay 9 sticks on your desk.
5. Make 9 marks — horizontal lines — on your slates.
6. Place 9 blocks in a row.
7. Count from 9 backward to 1.

8. What 2 numbers added together make 9 ?

*Children may give as many answers as possible to this question, as :  $1 + 8$  ;  $2 + 7$  ;  $3 + 6$  ;  $4 + 5$ , etc.*

9. What 3 numbers added together make 9 ?

10. Draw a line about 9 inches long.

11. Hold your hands 9 inches above your desks.

12. Lay two blocks on the floor about 9 feet apart.

13. Lay 9 blocks in a straight line on the floor, placing them one foot apart.

14. Measure 9 feet with a foot ruler.

## SEAT WORK.

1. Make 9 squares on your slates, all the same size.

2. Draw 9 right-triangles, all the same size.

3. Write 9 columns of 9's.

4. Write 9 lines of 9's.

5. Write this :

*Three, Six, Nine.*

6. With 9 1-inch sticks how many separate triangles can you make ? How many squares ?

7. With 9 1-inch sticks make a figure of 9 sides.

8. Write, like this, as many columns of figures as you can, the answer in every case to be 9.

2

1

3

1

2

9

9. Write the names of 9 objects in the schoolroom ; of 9 objects at home.

10. Write the names of 9 boys ; of 9 girls.

11. Name 9 things that you have learned about in this book.

## CLASS WORK.

1. What two numbers added together make nine? What three numbers?

2. Nine is how much more than 8? than 6? than 4? than 2? than 5? than 1? than 3? than 7?

*Illustrate these as far as appears to be necessary.*

3. Six is how much less than 9? Four is how much less? One is how much less?

4. Make three triangles with sticks, thus:



5. How many sticks were used to make each triangle? How many to make all?

6. Nine is how many times 3?

7. How many separate squares can you make with 9 sticks?

8. Nine is how many times 4?

9. At 3 cents each, how many pencils can you buy for 9 cents?

10. If you have 9 cents, how many 2-cent postage-stamps can you buy?

## SEAT WORK.

1. Draw a line 9 inches long.

2. Find two sticks which, taken together, are 9 inches long. Find three sticks which taken together are also 9 inches long.

3. Make with sticks a triangle which is 9 inches around.

4. From a line 9 inches long cut off 4 inches.

5. Copy, and fill the blanks:

$$9 = 8 +$$

$$9 = \quad + 6.$$

$$9 = 4 +$$

$$9 = \quad + 2.$$

$$9 = 1 +$$

$$6 = 9 -$$

$$4 = 9 -$$

$$9 - 1 =$$

$$9 = 3 \times$$

$$9 = 7 +$$

$$9 = \quad + 1.$$

$$9 = 6 +$$

$$9 = \quad + 5.$$

$$9 = 3 +$$

$$9 - 6 =$$

6. Draw 9 vertical lines.

7. Draw 9 horizontal lines.

8. Write three numbers which added together make 9.

## CLASS WORK.

1. Henry has nine pieces of money which together make 9 cents; what is each piece?

2. John has 9 cents, composed of 3 pieces all different; what are they?

3. Mary has 9 cents, composed of 3 pieces all alike; what are they?

4. Frank has 9 cents, composed of 3 pieces, two only of which are alike; what are they?

5. What cost 3 yards of ribbon at 3 cents a yard?

6. Tom bought 9 plums for 3 cents. How many plums would 1 cent buy?

7. Clara is 9 years old, and Emma is five. How much older is Clara than Emma?

8. I have 9 blocks to divide among 3 boys. How many shall I give to each boy?

9. What is  $\frac{1}{3}$  of 9?  $\frac{2}{3}$  of 9?

10. What is  $\frac{1}{2}$  of 9?  $\frac{1}{4}$  of 8?

11.  $\frac{1}{2}$  of 8 is how much more than  $\frac{1}{3}$  of 9?

*Make up a large number of miscellaneous questions like the above.*

## SEAT WORK.

1. Write three questions similar to those in the first column.

2. Add these columns:

3	1	1	3	5
2	2	4	1	2
1	3	2	3	1
2	2	2	1	1

3. See in how many ways you can arrange columns of 3, 4, or 5 figures, so that the sum of the numbers shall in every case be 9.

4. Draw a line 9 inches long; divide it into 3 equal parts.

5. Draw a line 9 inches long; divide it into 9 equal parts.

6. Copy, and fill the blanks:

$$9 = 4 +$$

$$9 = 1 +$$

$$9 = 3 +$$

$$9 = + 2.$$

$$9 = + 5.$$

$$9 = + 7.$$

$$9 = 3 + 3 +$$

$$9 = 4 + 1 +$$

$$9 = 6 + 1 +$$

$$9 = 3 + 4 +$$

*Be very sure that all your work is correctly done.*

## CLASS WORK.

1. Draw a line 9 inches long.
2. Draw a line 9 feet long.
3. Measure and cut a string 9 feet long. Measure another 9 yards long.

*Compare the above.*

4. Draw a line 3 yards long.

*Compare it with the line 9 ft. long already drawn.*

5. 3 yds. = how many feet?
6. How many yards in six feet? in nine feet?
7. Eight feet is how much less than 3 yds.? How much more than 2 yds.?

8.  $\frac{1}{3}$  of 9 inches = what?

9.  $\frac{1}{2}$  of 6 inches = what?

10. Walk a distance of 9 feet. How many steps did you take?
11. Walk a distance of nine yards. How many steps did you take?

*Extend these exercises, and continue them another day, or for several days.*

*Give the pupils such help as they actually need. But lead them each day to depend more and more upon doing and discovering for themselves.*

## SEAT WORK.

1. Draw a line 9 inches long; divide it into 2 equal parts.

2. Draw three parallel vertical lines, the sum of whose lengths is 9 inches.

3. Draw three parallel horizontal lines, the sum of whose lengths is 6 inches.

4. Draw a line one foot long.

5. From the above line cut off 9 inches.

6. What is the length of the part left?

7. Copy, and fill the blanks:

$$9 = 7 - 3 +$$

$$9 = 8 - 7 +$$

$$9 = 6 - 4 +$$

$$9 = 5 - 2 +$$

$$9 = 4 - 3 +$$

8. Copy, and fill the blanks:

$$9 - 7 =$$

$$9 - 5 =$$

$$9 - 3 = 6 -$$

$$9 - 6 = 6 -$$

9. Copy, and fill the blanks:

$$\frac{1}{3} \text{ of } 9 =$$

$$\frac{1}{2} \text{ of } 9 =$$

$$3 \text{ ft.} = \text{ yd.}$$

$$9 \text{ ft.} = \text{ yds.}$$

## CLASS WORK.

## A Square Yard.

1. Draw a square foot.
2. Draw on the blackboard a rectangle three feet long and one foot wide.
3. Divide this rectangle into square feet. How many square feet does it contain?
4. Draw another rectangle of the same size.
5. Draw a square three feet on each side.
6. Divide each side into feet, and draw lines as here :



7. Measure each of the small squares, and tell its size and name. How many are there?
8. Draw a square, each side of which is one yard. What do we call this square?

*Compare size of square yard with size of square three-feet.*

9. Learn this :

Nine Sq. Ft. = One Sq. Yd.

*Extend and continue these exercises. Let the pupils invent similar exercises.*

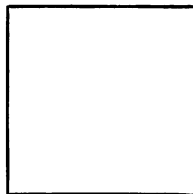
## SEAT WORK.

## Square Measure.

1. Write this, and learn it by heart :

*Nine Square Feet in One Square Yard.*

2. Cut a piece of paper 3 inches square.
  3. Cut several pieces one inch square.
  4. How many pieces one inch square equal the piece 3 inches square? Try it, and see.
  5. Draw in a row on your slates :
- 1st. A square inch.
  - 2d. A square two-inches.
  - 3d. A square three-inches.
6. Draw a square the same size as this :



7. What is the size of this square? Write its name.

## CLASS WORK.

## Time.

Learn this :

*Four Weeks = One Month.*

1. How much more than a week is nine days ?

2. Beginning with to-day, write the names of nine days in their order.

3. How many weeks in 2 months ?

4. How many weeks in half a month ?

5. One week is what part of a month ?

6. How many months in 6 weeks ?

7. How many months in 8 weeks ?

8. How many months in 9 weeks ?

9. Nine weeks is how much more than one month ?

10. How many working-days in a week ? in a week and a half ?

11. How many days in half a week ?

12. How many days in half a school-week ?

## SEAT WORK.

## Time.

1. Copy this carefully :

*Seven Days =  
One Week.*

*Four Weeks =  
One Month.*

*7 da. = 1 wk.*

*4 wk. = 1 mo.*

2. Copy, and fill the blanks :

9 da. = 1 wk. + da.

2 mo. = wk.

$\frac{1}{2}$  mo. = wk.

1 wk. = mo.

4 wk. = mo.

6 wk. = mo.

wk. = 2 mo.

9 wk. = mo.

9 wk. - 4 wk. = wk.

$\frac{1}{2}$  wk. =  $\frac{1}{2}$  of 7 da.

$\frac{1}{2}$  wk. = da.

3. Write the names of the days of the week.

4. Write the name of the present month ; the name of the month before this ; the name of the month following this.

## CLASS WORK.

## Review.

*Call up the main points of the preceding lessons.*

*Give a variety of practical questions involving or illustrating all these points.*

*Let the pupils buy, sell, and make change.*

*Let them measure lines, and draw squares and triangles. Let them measure grain and liquids.*

1. What cost 3 yd. of ribbon at 3 cts. a yard? at 2 cts. a yard?

2. If 1 ft. of wire cost 2 cts., what will 3 ft. cost? What will 1 yd. cost? What will 4 ft. cost?

3. Ella buys a pencil for 5 cents, and a rubber for 3 cents. What do both cost?

4. She pays 6 cents for them. How much does she still owe?

5. What three numbers added together = 9?

6. Divide 9 apples equally among 3 boys.

7. Divide 9 apples between 2 boys, so that one will have twice as many as the other.

8. Which is the more, 9 pecks or 2 bushels? How much?

## SEAT WORK.

## Review.

1. Copy, and fill the blanks:

$$3 \times 3 =$$

$$2 + 3 + 3 =$$

$$4 + = 9.$$

$$\frac{1}{3} \text{ of } 6 =$$

$$\frac{1}{2} \text{ of } = 2.$$

$$2 \times 4 =$$

$$2 \overline{)8}$$

$$4 \overline{)8}$$

$$\frac{1}{2} \text{ of } 8 =$$

$$\frac{1}{2} \text{ of } 9 =$$

2. Make up three questions like those in the other column.

3. Multiply the upper number by the lower:

1	2	3	2	4
3	3	3	2	2
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>

4. Add these columns:

	2	2	4	5
1	1	2	2	1
3	3	1	1	1
5	1	2	2	1
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>

5. Add these columns:

	1	2	2	1
5	3	1	1	1
3	1	2	2	1
1	2	2	4	5
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>

*Draw on the blackboard, or on large card-board, a square divided into smaller squares, as below, and write a figure in each square as here shown:*

*Allow this chart to remain a long time in view of the pupils. Give pupils constant drill in ready addition from this chart. At first, point-*

1	2	3	4	5	6	7	5	3
3	1	2	3	4	1	2	3	4
6	4	2	3	1	5	5	2	1
1	2	5	4	5	4	3	1	8
7	6	1	4	1	1	6	1	1
2	1	4	2	3	3	2	2	3
3	4	2	7	5	2	5	2	3
6	3	5	1	4	3	1	4	4
1	4	3	8	1	6	6	5	4

*ing to any number, require them immediately to name the sum of that number and the one just above it. For example, point to 8 in first column at right; the pupils immediately say, "Nine," that being the sum of 8 and 1. When they have become able thus to name the sum of any two numbers without any hesitation, require them to name not only the sum of the two pointed out, but also of the other two standing just above. For exam-*

*ple, point again to 8 in first column at right; the pupils at once say, "Nine," "Seven," — these numbers being sums respectively of 8 and 1, and 4 and 3. Point to 7 in first column at left, and they say, "Eight," "Nine." Continue this work until the children can give the sum of any two numbers (within the limits of the current lesson), as readily and quickly as they can name a single figure.*

*There are many advantages derived from drill of this sort which will be readily apparent to the teacher. Drill, drill, drill! Let the pupils memorize these combinations thoroughly, — so thoroughly that they will never hesitate (or stop to count), but will always give correct results at sight. Ginn's Adjustable Addition Tablet is an excellent substitute for this chart, and is to be used in the same way.*



## CLASS WORK.

## Odd and Even.

1. Write the numbers 2, 4, 6, 8, on the blackboard.

2. How much greater is 4 than 2? 6 than 4? 8 than 6?

3. Each one of these numbers can be divided evenly by 2. Hence we call them *even* numbers.

4. Divide 2 inches into two equal parts; divide 4 inches, 6 inches, 8 inches, in the same way.

5. Write the numbers 1, 3, 5, 7, 9, on the blackboard.

6. Not one of these numbers can be evenly divided by 2. We call them *odd* numbers.

7. Divide 3 inches into two equal parts; 5 inches; 7 inches; 9 inches.

8. Have you an odd number of fingers on each hand? An odd number of thumbs?

9. Is there an odd number of days in a week? an odd number of weeks in a month?

10. An odd number of quarts in a gallon? an odd number of feet in a yard?

## SEAT WORK.

## Odd and Even.

1. Write this, and remember it:

*Even Numbers.*

2. 4. 6. 8.  
*Odd Numbers.*

1. 3. 5. 7. 9.

2. Copy, and fill the blanks:

$$2 \times 2 =$$

$$2 \times 4 =$$

$$2 \times 2 \times 2 =$$

$$2 \times 3 =$$

$$3 \times 3 =$$

$$4 = \times$$

$$8 = \times$$

$$8 = 2 \times 2 \times$$

$$6 = \times$$

$$9 = \times$$

3. Copy, and fill the blanks:

$$2 \times 2 \text{ qt.} = 4 \text{ qt.}$$

$$4 \text{ qt.} = \text{gal.}$$

$$2 \times 4 \text{ qt.} = \text{pk.}$$

$$8 \text{ qt.} = \text{pk.}$$

$$4 \text{ qt.} = \text{pk.}$$

$$\text{pk.} = 1 \text{ bu.}$$

$$\text{pk.} = 2 \text{ bu.}$$

## CLASS WORK.

1. If each of three boys has two cents, how much have they all?
  2. How many fingers have you on both hands?
  3. How many more fingers than thumbs have you?
  4. How many pecks in nine dry quarts?
  5. How many pecks in 2 bushels?
  6. If a gallon of milk cost 8 cents, how much is that a quart? how much a pint?
  7. Two yards and two feet are how many feet? How much less than 3 yards?
  8. If a man works 3 days each week, what part of the week is he idle?
  9. How many square feet in one square yard?
  10. How high is your desk?
  11. How tall are you?
- Let the children measure.*
- Make up many questions similar to these.*
12. How many hours are you in school each day, if you come at 9 o'clock and remain till 5?

## SEAT WORK.

1. Write five questions similar to those in the first column.
2. Draw nine lines, beginning with a line one inch long, and make each succeeding one one inch longer than that which precedes it.
3. Divide each of these lines into halves.
4. Copy, and fill the blanks:
 

$\frac{1}{2}$ of 1 =	
$\frac{1}{2}$ of 2 =	
$\frac{1}{2}$ of 4 =	
$\frac{1}{2}$ of 6 =	
$\frac{1}{2}$ of 8 =	
$\frac{1}{2}$ of 7 =	
$\frac{1}{2}$ of 5 =	
$\frac{1}{2}$ of 3 =	
$\frac{1}{2}$ of 1 qt. =	pt.
$\frac{1}{2}$ of 1 gal. =	qt.
$\frac{1}{2}$ of 1 bu. =	pk.
5. Write this, and remember:
 

A.M.	stands for <i>Forenoon</i> .
P.M.	stands for <i>Afternoon</i> .
M.	stands for <i>Noon</i> .
da.	stands for day or days.
hr.	stands for hour or hours.
wk.	stands for week or weeks.
mo.	stands for month or months.

## CLASS WORK.

1. Here is a square piece of paper 2 feet long and 2 feet wide. How many square feet in the piece?

2. Here is another square piece 1 foot each way. Hence, as you have already learned, it is 1 square foot.

3. How many pieces the size of the smaller piece will be required to cover the larger one?

4. Here is another square piece 1 yard long and 1 yard wide. How many square yards in it?

5. Now find how many square feet in this larger piece.

6. One square yard = square feet.

*Illustrate the same principle with oblong pieces; for example, a piece 9 ft. long and 1 ft. wide, how many square feet does it contain? It is therefore equal to how many yards?*

*Review all the lessons previously given on square measure.*

*Carefully explain every difficult point. Continue for several days on exercises of this kind.*

## SEAT WORK.

1. Write the following, and fill blanks where they occur:

$$3 \text{ ft.} = 1$$

$$\text{sq. ft.} = 1 \text{ sq. yd.}$$

$$2 \text{ pt.} =$$

$$\text{qt.} = 1 \text{ gal.}$$

$$8 \text{ qt.} =$$

$$\text{pk.} = 1 \text{ bu.}$$

$$7 \text{ da.} =$$

$$4 \text{ wk.} =$$

$$3 \overline{)9}$$

$$2 \overline{)4}$$

$$\frac{1}{3} \text{ of } 9 =$$

$$\frac{1}{3} \text{ of } 6 =$$

$$3 + 2 =$$

$$\frac{1}{3} \text{ of } 9 + \frac{1}{3} \text{ of } 6 =$$

$$\frac{1}{2} \text{ of } 8 =$$

$$\frac{1}{2} \text{ of } 4 =$$

$$4 + 2 =$$

$$\frac{1}{2} \text{ of } 8 + \frac{1}{2} \text{ of } 4 =$$

2. Write, and remember:

One Square Yard = 9 Square Feet.

$$2 \times 1 = 2.$$

$$2 \times 2 = 4.$$

$$2 \times 3 = 6.$$

$$2 \times 4 = 8.$$

$$3 \times 2 = 6.$$

$$3 \times 3 = 9.$$

## THE NUMBER TEN.

## CLASS WORK.

1. Nine and one more are how many?

2. Count ten; count 20.

3. Make ten marks on your slates.

4. Place ten sticks in a row on your desks.

5. Take ten steps forward; backward.

6. Write in figures all the numbers from 1 to 9.

7. Besides these figures, we have another character, 0. Written alone it does not stand for any number, but means naught or nothing. We call it a Cipher.

8. With the following characters, we may write any number: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

How many characters are there?

*Show pupils how to write the number 10.*

*Explain that a figure written in the second place from the right means so many tens.*

The figures composing this number designate 1 *ten* and 0 *ones*.

## SEAT WORK.

1. Write in words all the numbers from One to Nineteen.

2. Write in figures all the numbers from 1 to 19. (How many numbers are written with one figure only?)

3. Make 10 vertical lines, each 1 inch long, on your slates.

4. Make 10 horizontal lines the same length.

5. With 10 sticks, each one inch long, make as many squares as you can.

6. With the same number of sticks make as many triangles as you can.

7. Make a line on your slates 10 inches long.

8. Draw 10 squares. Draw 10 triangles.

9. Write the names of 10 objects in the schoolroom; of 10 girls; of 10 boys.

10. Write the names of 10 things bought at the grocery store; of 10 objects to be seen in the woods; of 10 objects to be seen in the streets.

## CLASS WORK.

1. Mary had 10 pins, and Ella had 8. How many more had Mary than Ella?

2. How many fingers have you? How many thumbs? Thumbs and fingers together, how many?

3. Ten is how much more than 9? than 7? than 2? than 3? than 5? than 4? than 6?

4. What three numbers added together make 10?

*Ask many other similar questions.*

5. Draw a line 10 inches long. Draw another line one foot long.

6. From the line one foot long cut off ten inches. What is the length of the part which remains?

7. Draw a line 10 feet long. Draw a line 3 yards long.

8. Which is greater, 3 yds. or 10 ft., and how much?

9. How long is this room?

10. Measure 10 yards in length. How many yards greater (or less) is this than the length of this room?

## SEAT WORK.

1. Copy, and fill the blanks:

$$10 - 8 =$$

$$4 + 4 =$$

$$8 + 2 =$$

$$10 = 9 +$$

$$10 = 7 +$$

$$2 + = 10.$$

$$3 + = 10.$$

$$10 = 5 +$$

$$4 + = 10.$$

$$6 + = 10.$$

$$2 + 2 + 2 + 2 =$$

$$3 + 3 + 3 + = 10.$$

$$4 + 4 + = 10.$$

2. Draw ten parallel lines, each 10 inches long.

3. Draw five parallel vertical lines, each  $\frac{1}{2}$  of 10 inches long.

4. Add the following columns:

2	3	4	5	7
5	1	1	1	1
1	2	1	1	1
1	3	2	3	1

5. Copy, and fill the blank spaces:

$$2)\underline{8} \qquad 3)\underline{\quad} \qquad 2)\underline{10}$$

$$3$$

$$2)\underline{5} \qquad 2)\underline{\quad} \qquad 5)\underline{10}$$

$$1\frac{1}{2}$$

## CLASS WORK.

1. Measure 10 pints of water into a pail.
2. How many quarts in 10 pints?
3. How many gallons in 5 quarts?
4. Measure 10 dry quarts of wheat.
5. How many pecks in 10 dry quarts?
6. In 10 quarts how many gallons?
7. If a man sold two quarts of milk to one customer, one gallon to another, and three quarts to another, how much did he sell to the three?
8. If 10 pints of buttermilk cost 10 cents, what does one pint cost? What do two pints cost? What does one quart cost?
9. What cost 8 gallons of molasses at \$1 a gallon?
10. If milk costs 5 cents a pint, what is the cost per quart?
11. I once saw a vessel which held one quart more than  $\frac{1}{2}$  gallon. How many quarts did it hold? How many pints?

## SEAT WORK.

1. Write five questions about the buying and selling of grain.
2. Write five questions about the buying and selling of something sold by the pint or quart.
3. Add the following columns:

	1	1	5	4
2	3	2	1	2
5	4	3	2	1
<u>2</u>	<u>2</u>	<u>4</u>	<u>1</u>	<u>3</u>

4. Multiply the following:

4	3	5	2	2
<u>2</u>	<u>3</u>	<u>2</u>	<u>4</u>	<u>5</u>

5. Divide as below:

2) <u>10</u>	3) <u>9</u>	4) <u>8</u>
4) <u>10</u>	5) <u>10</u>	2) <u>8</u>

6. Copy, and fill the blanks:

$$8 \times 1 =$$

$$2 \times 5 =$$

$$\frac{1}{2} \text{ gal.} = \text{quarts.}$$

$$\frac{1}{2} \text{ gal.} + 1 \text{ qt.} = \text{quarts.}$$

$$3 \text{ quarts} = \text{pints.}$$

7. Divide a line 10 in. long into two equal parts.
8.  $\frac{1}{2}$  of 10 in. = what?

## CLASS WORK.

1. Here is another piece of money — a ten-cent piece. It is sometimes called a *dime*. Learn this :

*Ten Cents = One Dime.*

2. Ten of these dimes, or ten-cent pieces, are worth one dollar.

3. Learn this :

*Ten Dimes = One Dollar.*

4. Besides the pieces we have already learned about, there are certain pieces made of gold ; among these are :

The two-and-a-half-dollar piece,

The five-dollar piece,

The ten-dollar piece.

5. A ten-dollar gold piece is called an *eagle*.

6. Learn this :

*Ten Dollars = One Eagle.*

7. Here also is a ten-dollar bill, which is worth one eagle.

8. Of what is money made ?

9. What 4 pieces of money are together worth 10 cents ? What 3 pieces ? What 2 pieces ?

10. What 3 bills are together worth 8 dollars ?

## SEAT WORK.

1. Write the following :

*Ten Cents =  
One Dime.*

*Ten Dimes =  
One Dollar.*

*Ten Dollars =  
One Eagle.*

2. Copy, and fill the blanks :

10 cts. = dime.

1 cts. =  $\frac{1}{2}$  dime.

10 dimes = dollar.

dimes =  $\frac{1}{2}$  dollar.

10 dollars = eagle.

dollars =  $\frac{1}{2}$  eagle.

dollars =  $\frac{1}{4}$  eagle.

3. Fill out the following blanks :

**I. Pieces of Money made of Copper.**

**II. Pieces of Money made of Nickel.**

**III. Pieces of Money made of Silver.**

## CLASS WORK.

1. John and Frank each had 5 cents. How much money had both?

2. Ella has one dime, and Mary has 5 times as much. How much has Mary?

3. What part of a dollar has Mary?

4. Charles has a coat which cost 10 dollars; his new sled cost half as much. What was the cost of the sled?

5. Belle bought two oranges, at  $\frac{1}{2}$  dime each. What did both cost?

6. What part of an eagle is  $2\frac{1}{2}$  dollars?

7. How many dollar bills will buy a gold eagle?

8. What 3 pieces of money, all different, are equal to ten cents?

9. Take one dime from one dollar; how many dimes remain?

10. Five dimes are worth what part of a dollar?

*Let the pupils buy and sell, using all the pieces of money they have learned about.*

## SEAT WORK.

1. Pieces of "Paper Money."

-----  
 -----  
 -----  
 -----

2. Pieces of gold.

-----  
 -----  
 -----  
 -----

3. Write this:

ct. stands for cent.

cts. stands for cents.

d. stands for dime.

dol. stands for dollar.

\$ stands for dollar.

\$ stands for dollars.

4. Copy this, and fill all blank spaces:

10 cents = 1

10 dimes = 1

10 dollars = 1

1 dime = cents.

$\frac{1}{2}$  dime = cents.

$\frac{1}{2}$  dollar = dimes.

$\frac{1}{2}$  eagle = dollars.

$\frac{1}{4}$  dollar = dimes.



## CLASS WORK.

1. Measure the length of this room in yards and feet.

2. Write the measurement of its length on the board, thus :

yards      feet.

3. Measure the width of the room in yards and feet.

4. Here are some blocks. Measure the length, width, and thickness of each.

5. Here is a box on my table. Measure its length, breadth, and thickness.

6. Here is an oblong, drawn on the blackboard, ten feet long and one foot wide.

7. Here is a square which you may measure. (One square foot.) How often is the one square foot contained in the oblong?

8. Divide the oblong into square feet.

9. Suppose the oblong were only 7 feet long instead of 10, how many square feet would it contain?

10. Suppose it were only five feet long? 3 feet long?

## SEAT WORK.

1. Measure the height of your desk.

2. Measure its length.

3. Measure its width.

4. Count the windows in the room.

5. Count the panes of glass in one of the windows.

6. Cut a string the same length as this room.

7. Here are ten cards, each one inch square. You may see how many squares or oblongs you can form from them, and the size of each.

8. Copy on your slates the squares or oblongs which you thus make, being careful that the copy shall show exact size.

9. Write ten columns of figures like this, the sum of each column being 10 :

$$\begin{array}{r} 4 \\ 2 \\ 1 \\ 3 \\ \hline 10 \end{array}$$

10. What two numbers added together make 10? What three numbers? What four numbers?

## CLASS WORK.

1. How many weeks and days in 10 days?

2. How many weeks in 10 school-days?

3. How many school-days in 2 weeks? How many holidays?

4. How many months in 10 weeks?

5. If a man earns 3 dollars a day, in how many days will he earn 9 dollars?

6. One week is how many days less than 10 days?

*Ask many other similar questions. Let the pupils make up questions of the same kind.*

## Review.

*Call up the main points of the last fifteen lessons.*

*Give a variety of practical questions involving or illustrating these points.*

*Let the pupils buy, sell, and make change. Let them measure lines and squares. Let them measure grains and liquids.*

*Several recitation hours, or parts of such hours, may be profitably spent in reviews of this kind.*

## SEAT WORK.

1. Write three questions similar to those in the first column.

2. Copy, and fill the blanks:

4 wk. = month.

wk. =  $\frac{1}{2}$  mo.

7 da. = week.

da. =  $\frac{1}{2}$  wk.

10 da. = 1 wk. + da.

10 wk. = mo. + wk.

3. Write the names of ten months in order, beginning with January. Here they are:

1. January. 6. June.

2. February. 7. July.

3. March. 8. August.

4. April. 9. September.

5. May. 10. October.

## Review.

Write the following, and if you have not already memorized it, do so now:

$2 \times 1 = 2.$        $3 \times 1 = 3.$

$2 \times 2 = 4.$        $3 \times 2 = 6.$

$2 \times 3 = 6.$        $3 \times 3 = 9.$

$2 \times 4 = 8.$

$2 \times 5 = 10.$

$4 \times 1 = 4.$        $5 \times 1 = 5.$

$4 \times 2 = 8.$        $5 \times 2 = 10.$

## CLASS WORK.

**Buying and Selling.**

1. Frank buys 4 pints of hazel-nuts at 2 cents a pint. What do they cost?

2. He gives the seller 2 five-cent pieces. How much?

3. The seller returns how much change?

4. Frank now sells his hazel-nuts for 5 cents a quart. How much does he get for them?

6. Mary buys 2 yards of ribbon for 10 cents. How much a yard?

6. She pays the shop-man with 3 pieces of money (all different). What are the pieces?

7. She gives 1 foot of the ribbon to Alice, and 1 foot to Nellie. How much remains?

8. If you buy a pencil for 5 cents, and a sponge for 3 cents, what do both cost?

9. If you sell them for 10 cents, how much do you gain?

10. How many marbles can you then buy, at 2 cents each?

*Make up many questions similar to the above. Let the pupils perform the operations.*

## SEAT WORK.

1. Write three questions like those in the first column.

2. Copy, and fill the blanks:

$$10 = 2 \times$$

$$\frac{1}{2} \text{ of } 10 =$$

$$\frac{1}{2} \text{ of } 8 =$$

$$\frac{1}{2} \text{ of } 10 + \frac{1}{2} \text{ of } 8 =$$

$$\frac{1}{3} \text{ of } 9 =$$

$$\frac{1}{3} \text{ of } 8 =$$

$$\frac{1}{3} \text{ of } 9 + \frac{1}{3} \text{ of } 8 =$$

$$\frac{2}{3} \text{ of } 9 =$$

$$\frac{2}{3} \text{ of } 8 =$$

$$\frac{2}{3} \text{ of } 8 =$$

$$2 \times 3 =$$

$$3 \times 2 =$$

$$\frac{1}{4} \text{ of } 10 =$$

$$\frac{1}{4} \text{ of } 10 =$$

$$\frac{3}{4} \text{ of } 10 =$$

$$\frac{3}{4} \text{ of } 10 =$$

3. Draw a rectangle 4 inches long and 2 inches wide.

4. Draw another rectangle half as large as the first.

5. Draw a third rectangle half as large as the second.

6. Divide the first rectangle into 8 equal squares.

7. Divide the second rectangle into 4 equal squares.

## CLASS WORK.

**Miscellaneous.**

1. From a line 10 feet long cut off 6 feet. What length remains?

2. From 3 yards take 3 feet. How many yards remain? How many feet?

3. From 1 gallon of water pour off 2 quarts. What remains?

4. From 10 pecks take 2 pecks. How many pecks remain? How many bushels?

5. From 10 dimes take 9 dimes. How many dimes are left? How many cents?

6. From 10 days take 1 week. How many days remain?

7. From 10 weeks take 2 weeks. How many weeks remain? How many months?

8. There were 10 birds in a tree; six of them flew away. How many remain?

9. Alice had 10 yards of ribbon; she gave half of it to Ann, and 1 yard to Ella. How much was left?

*Make other similar questions.*

## SEAT WORK.

1. Here are ten square pieces of pasteboard, each one inch square. Arrange them into as many figures as you can.

2. Here are ten sticks. Arrange them in a similar way.

3. Write three questions like those in the first column.

4. Copy, and fill the blanks:

$$10 - 6 =$$

$$3 \text{ yds.} = 9 \text{ ft.}$$

$$9 \text{ ft.} - 3 \text{ ft.} = \text{ ft.}$$

$$4 \text{ qt.} - 3 \text{ qt.} =$$

$$10 \text{ pk.} - 2 \text{ pk.} = \text{ pk.}$$

$$8 \text{ pk.} = \text{ bu.}$$

5. Draw a rectangle 3 inches long and  $1\frac{1}{2}$  inches wide.

6. Draw three kinds of triangles, and write the name of each.

7. Write this, filling the blanks:

$$2 \text{ pt.} = 1 \text{ qt.}$$

$$4 \text{ qt.} =$$

$$\text{gal.} = 1 \text{ pk.}$$

$$4 \text{ pk.} =$$

$$3 \text{ ft.} =$$

$$7 \text{ da.} =$$

$$\text{wk.} = 1 \text{ mo.}$$

## CLASS WORK.

## Dry Measure.

1. If 4 bushels of wheat can be bought for \$8, what is the cost of 1 bushel?

2. If 4 bushels cost \$10, what is the cost of a bushel? of two bushels?

3. How many bushels in 8 pecks? in 10 pecks?

4. Measure one peck of corn. Measure into the same vessel two quarts of corn. How many quarts of corn have you poured into the measure?

5. If a bushel of wheat cost \$1, and a bushel of grass-seed cost \$5, what is the cost of a bushel of each? What of 1 bushel of grass-seed and 4 bushels of wheat?

6. If a peck of apples cost 5 dimes, what will half a bushel cost? Five dimes is what part of a dollar?

7. William bought 5 bushels of potatoes for 10 dollars, and sold them for 5 dollars. How much did he lose?

*Make up many other questions similar to the above.*

## SEAT WORK.

1. Write 5 questions like those in the first column.

2. Draw three triangles.

3. With ten sticks make as many squares as you can.

4. With ten sticks make as many triangles as you can.

5. From a cord ten feet long, cut as many yards as you can.

6. From the part that you have left, cut off 6 inches.

7. What is the length of the other part?

8. Copy, and fill the blanks:

$$\frac{1}{2} \text{ of } 10 =$$

$$\frac{1}{4} \text{ of } 10 =$$

$$\frac{1}{8} \text{ of } 10 =$$

$$\frac{1}{3} \text{ of } 9 =$$

$$\frac{1}{5} \text{ of } 10 =$$

$$10 \text{ ft.} = \quad \text{yd.} \quad \text{ft.}$$

9. From the upper number take the lower:

10	9	8	7	6	5	4	10
3	4	5	6	1	2	3	4

10. Multiply the upper number by the lower:

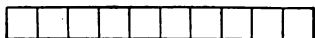
2	3	4	5	3	2	2
2	2	2	2	3	4	5

## CLASS WORK.

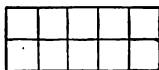
*Give the children ten square pieces of paper, each one inch square.*

*Let them arrange these in such manner as to form an oblong.*

*One arranges them thus :*



*Another arranges them thus :*



*From the first, get the idea of the area of any surface 1 inch wide by 10 inches long.*

$$10 \times 1 = 10.$$

*From the second, the idea of the area of any surface 2 inches wide by 5 inches long.  $5 \times 1 = 5$ , number of square inches in upper row.  $5 \times 1 = 5$ , number of square inches in lower row.*

For brevity, we write it thus :

$$5 \times 2 = 10.$$

*Teach what is meant by area.*

*What is the area of a piece of paper 4 inches long and 2 inches wide? of one 3 inches square? of one 3 inches long and 2 inches wide? of one 2 inches square? Try each.*

## SEAT WORK.

1. Write this :

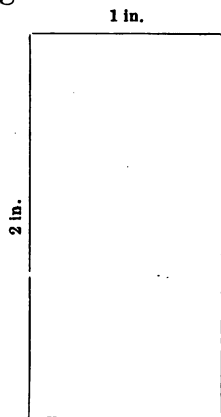
The area of anything = the number of square inches, square feet, or square yards it contains.

2. Cut a piece of paper so as to make it 2 in. wide and 4 in. long. Write on it its area in square inches.

3. Cut another piece 3 inches long and 2 inches wide. What is its area?

4. Cut a piece of paper so that its area will be 9 square inches.

5. What is the area of this rectangle?



6. Draw a rectangle having an area twice as great.

## CLASS WORK.

*Continue the work of Lesson XLIV., extending the measurements to feet and square feet, and yard and square yard.*

*Use blackboard and other large surfaces, — the floor or the sidewalk, — instead of the slates.*

1. What is the area of a card 10 in. long and 1 in. wide?

2. If the card had been  $\frac{1}{2}$  inch wide, what would have been its area?

3. What is the area of a map 2 ft. wide and 4 ft. long?

4. What is the area of a board 1 ft. wide and 8 ft. long?

5. If the board had been only  $\frac{1}{2}$  foot wide, what would have been its area?

6. What is the area of a rug 1 yard long and 2 feet wide?

7. Draw on the floor a rectangle 2 ft.  $\times$  4 ft.

8. Divide it into square feet.

9. Find the area of a flower-bed 6 ft. long and  $1\frac{1}{2}$  ft. wide.

10. What is the distance around the edge of another flower-bed 3 ft. long and 2 ft. wide?

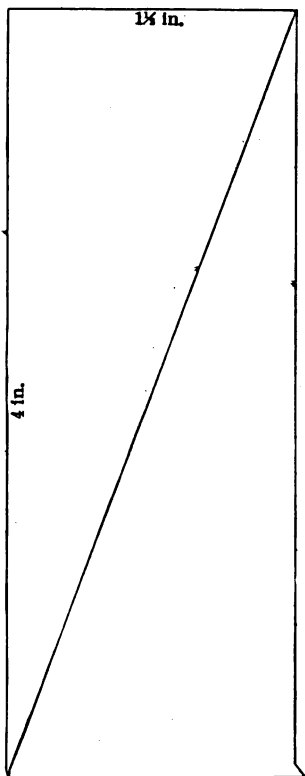
## SEAT WORK.

1. Draw a rectangle 10 in. long and 2 in. wide.

2. Divide it into square inches.

3. Count the square inches.

4. Find the area of this rectangle and of each of the triangles into which it is divided:



## CLASS WORK.

*Teach how to read and write the Roman numerals from I to X.*

*Review any of the preceding lessons not thoroughly understood by all the pupils.*

1. How do you write 5 in Roman characters?

2. How do you write 1?

3. How do you write 1 less than 5, or 4?

4. How do you write 1 more than 5, or 6?

5. Observe that if a number is taken from a larger number, it is written at the left of that larger number.

6. If a number is added to a larger number, where is it written?

7. How is 7 written?

8. How is 8 written?

9. How is 10 written?

10. How is 1 less than 10 written?

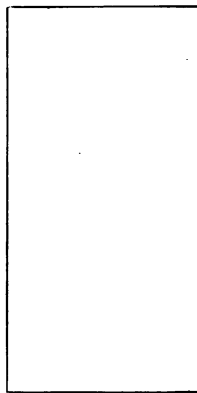
11. How, then, would you suppose 1 more than 10 is written?

12. Write, in three ways, all the numbers from 1 to 10.

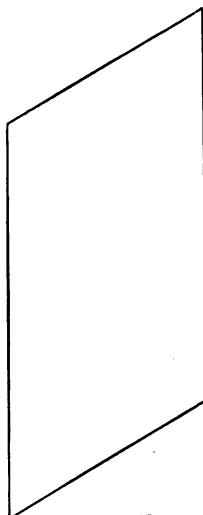
## SEAT WORK.

1. Copy the following:

One.	1.	I.
Two.	2.	II.
Three.	3.	III.
Four.	4.	IV.
Five.	5.	V.
Six.	6.	VI.
Seven.	7.	VII.
Eight.	8.	VIII.
Nine.	9.	IX.
Ten.	10.	X.



RECTANGLE.



TRAPEZOID.

2. Cut two pieces of paper the same size as these figures.

3. Can you show that both have the same area?



## CLASS WORK.

1. If 3 apples cost 6 cents, what is the cost of one apple?

2. At the same rate, how many apples can you buy for 10 cents?

3. If 9 bushels of oats can be bought for \$3, how many bushels can be bought for \$1?

4. If 2 boys can do a piece of work in 4 days, how long will it take one boy to do it?

5. If one gallon of molasses costs \$1, what will 9 gallons cost?

6. If one quart of grass-seed costs  $\frac{1}{2}$  dollar, what will one peck cost?

7. What will  $\frac{1}{2}$  bushel cost, at the same rate?

8. If a tin can holds 2 gallons of coal-oil, how many times can you fill a lamp from it, if the lamp holds 2 quarts?

9. If 6 marbles cost 9 cents, what are 2 such marbles worth? What are 4 such marbles worth?

10. If a hat costs \$3, a vest \$2, and a coat \$4, what do all cost?

*Make other questions like these.*

## SEAT WORK.

1. Write three questions like those in the first column.

2. Copy, and fill the blanks:

$$2 + 3 + \quad = 10.$$

$$3 + 1 + 5 =$$

$$1 + 2 + 3 = 10 -$$

$$3 + 2 + 1 = \quad - 4.$$

$$4 + 2 + 2 =$$

$$\frac{1}{2} \text{ of } 10 =$$

$$\frac{1}{2} \text{ of } 8 =$$

$$2 \times \quad = 4.$$

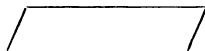
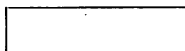
$$\frac{1}{2} \text{ of } 8 = 2 \times$$

$$\frac{1}{2} \text{ of } 10 =$$

$$\frac{1}{10} \text{ of } 10 =$$

3. Multiply these numbers:

3	2	4	2	2	3	5
3	5	2	3	4	2	2



4. Write the names of all these figures.

5. Draw other figures having the same size and shape.

6. Measure the length and width of each.

## THINGS LEARNED IN THIS STEP.

## CLASS WORK.

## Review.

1. *The numbers 6 to 10.*
2. *Meaning of the words add and multiply.*
3. *What is an oblong, and how to draw it. A rectangle.*
4. *Seven days = one week.*
5. *Buying, selling, and making change.*
6. *Abbreviations used in measurements, and also as applied to money.*
7. *Eight quarts = one peck.*
8. *Square inches, square feet, and square yards.*
9. *Measuring length.*
10. *Measuring capacity—dry measure.*
11. *Measuring capacity—liquid measure to gallons.*
12. *Four weeks = one month.*
13. *Idea of  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ,  $\frac{1}{16}$ .*
14. *Horizontal lines, vertical lines, slanting lines.*
15. *What is meant by columns of figures and lines of figures.*
16. *How to add columns of figures.*
17. *Nine sq. ft. = 1 sq. yd.*

## SEAT WORK.

## Review.

1. Write the numbers from 1 to 10.
2. Draw an oblong 5 inches long and 2 inches wide.
3. Write the names of the days of the week.
4. Write abbreviations for the following words:

cents =	quarts =
dollars =	pecks =
inches =	bushels =
feet =	days =
yards =	weeks =
pints =	months =

5. 2 mo. = wk.
- 8 qt. = pk.
- $\frac{1}{2}$  pk. = qt.

6.  $\frac{1}{2}$  of 6 =
- $\frac{1}{3}$  of 8 =
- $\frac{1}{10}$  of 10 =

7. Add these columns:

1	2	2	3	4
1	2	1	1	1
1	2	2	3	3
1	2	1	1	1
1	2	2	2	1

## THINGS LEARNED IN THIS STEP.—Continued.

## CLASS WORK.

## Review.

18. *Rapid addition — sums not exceeding 10.*

19. *Even numbers ; odd numbers.*

20. *How to write the number 10.*

21. *Meaning of the character 0.*

22. *Ten cents = one dime.*

*Ten dimes = one dollar.*

*Ten dollars = one eagle.*

23. *The sign \$.*

24. *What is meant by area.*

25. *How to find areas of small surfaces.*

26. *How to draw a trapezoid.*

27. *How to write Roman numerals to X.*

*Teacher will review thoroughly each of the preceding points, giving additional exercises when possible.*

*Remember that the two great objects to be attained by means of these lessons are quickness of perception and accuracy. Require pupils to perform all ordinary operations within the limits of this Step readily and correctly.*

## SEAT WORK.

## Review.

8. Write all the odd numbers under 10.

9. Write all the even numbers under 10.

10.  $\frac{1}{10}$  of 1 dime = cents.

$\frac{1}{10}$  of 1 dol. = dime.

1 dime = cents.

$\frac{1}{10}$  of 1 dol. = cents.

11. Draw 10 vertical lines, each 1 inch long.

12. Draw 10 horizontal lines, each 1 inch long.

13. Draw 10 slanting lines, all having different slants.

14. Write the sign commonly used for dollar or dollars.

15. Draw a rectangle.

16. Draw a trapezoid having the same area as the rectangle.

17. Subtract the lower number from the upper :

9	8	5	6	7	7	9
6	4	1	5	3	4	2
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

18. Multiply :

3	3	4	2	5
2	3	2	4	2
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

## OTHER THINGS TAUGHT IN THIS STEP.

*Before reaching the fortieth lesson, teach the pupils to count higher numbers, — say to 100.*

*To read numbers to 99.*

*To write numbers to 99.*

*To measure length and breadth of familiar objects.*

*To have a more accurate conception of length and capacity, judging by sight alone.*

*To write numbers with great accuracy and neatness.*

*To ask questions involving the principles taught.*

*To construct squares, rectangles, and triangles of given dimensions.*

*To give the sum — not exceeding ten — of any two numbers, at sight; and later, the sums of two pairs of numbers, at sight.*

*To perform readily the simpler operations of buying, selling, and making change.*

# THE INDUSTRIAL ARITHMETIC.



*STEP THE THIRD.*

TEN TO TWENTY.



## STEP THE THIRD.



### THINGS ALREADY LEARNED.

See Step the Second, page 57, and pages 107 and 108. See, also, *Review of Steps First and Second*, on next page.

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### CAUTION.

Turn to page iv, Step the First, and read again the Directions to Teachers. In the teaching of the Third Step, there are greater opportunities for illustration and for practical work. Do not neglect these opportunities. Shun formal "processes" and rules. Let every lesson be a voyage of discovery.

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### THINGS NEEDED.

See Step the First, page 3. Besides the articles mentioned there, the school should be provided with :

Pieces of cardboard or thin pasteboard for cutting.

Large sheets of paper.

Strings and cords of many feet in length.

A set (several sets, if possible) of weights avoirdupois, with balance (or balances).

A rod-pole or chain.

# REVIEW OF STEPS FIRST AND SECOND.

*Test the pupils' knowledge :*

1. *Of the comparative value of numbers from 1 to 10.*
2. *Of simple operations in adding, multiplying, subtracting, and dividing.*
3. *Of parts of numbers, as  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ , etc. (But shun mention of the word fraction.)*
4. *Of measurements of length : 1 inch to 10 inches ; 1 foot to 10 feet ; 1 yard to 10 yards.*
5. *Of measurements of capacity : liquid measure — pints, quarts, gallons ; dry measure — pints, quarts, pecks, bushels.*
6. *Of time : days in a week, weeks in a month.*
7. *Of odd numbers and even numbers.*
8. *Of squares, rectangles, and triangles of given dimensions.*
9. *Of lines — horizontal, vertical, slanting.*
10. *Of areas.*
11. *Of buying, selling, and making change.*

*Test the pupils' ability :*

*To add, at sight, any two, three, or four numbers whose sum does not exceed 10.*

*To name, at sight, the difference between any two numbers less than 10.*

*To distinguish, at sight, lengths in inches not exceeding 10 inches ; lengths in feet not exceeding 10 feet.*

*To draw, off-hand, straight lines of given lengths.*

*To draw, off-hand, triangles and squares of different dimensions.*

*To distinguish pieces of money at sight.*

*To make change readily and accurately.*

*To estimate the cost of things within the limits of the preceding step.*

*To distinguish  $\frac{1}{2}$  of any object or of any number not greater than 10.*

*Also  $\frac{1}{3}$ ,  $\frac{1}{4}$ , and  $\frac{1}{5}$  of an object or number.*



## THE NUMBER ELEVEN.

## CLASS WORK.

10

1. How many figures are required to write the above number?

2. What does the figure on the left show? What does the figure on the right show?

3. Suppose instead of having 1 ten and *no* ones, we have 1 ten and 1 one, how would we write the number?

11

4. In the same way, write numbers to 19, explaining the meaning of each figure.

5. Is 11 an odd number or an even? Why?

6. Clap your hands 11 times. Take 11 steps forward; backward. Make 11 short lines on your slates.

7. Make a pile of 10 books on the table. Put one other book on the table. A pile of ten books + one book = how many books? What does the figure at the left show? What does the other figure show?

## SEAT WORK.

11

1. Write all the numbers from 1 to 19.

2. Draw 11 lines, each one inch long.

3. Draw one line eleven inches long.

4. Measure a line half of eleven inches long.

5. Copy this:

One.	1.	I.
Two.	2.	II.
Three.	3.	III.
Four.	4.	IV.
Five.	5.	V.
Six.	6.	VI.
Seven.	7.	VII.
Eight.	8.	VIII.
Nine.	9.	IX.
Ten.	10.	X.
Eleven.	11.	XI.

6. Write the names of 11 objects in the schoolroom.

7.  $11 = 3 +$   
 $11 = 5 +$   
 $11 = 7 +$   
 $11 = 9 +$   
 $11 = 4 +$

## CLASS WORK.

1. Eleven is how many more than 10?
2. What other number is as much less than 10 as 11 is more than 10?
3. Eleven is how many more than 7? 5? 3? 8? 2? 6? 4?
4. Eleven is 3 more than what number?
5. What is  $\frac{1}{2}$  of 11 inches?
6. From a line one foot long, cut off 11 inches. How long is the part which remains?
7. What 2 pieces of money together make 11 cents?
8. What 4 pieces, all different, together make 11 cents?
9. Eleven feet are how much more than one yard? than 3 yards?
10. Eleven quarts equal how many gallons? Eleven pints equal how many quarts?
11. Mary is 11 years old, and Anna is 7. How much older is Mary than Anna?
12. William bought 3 oranges, at 3 cents apiece, and sold them for 11 cents. How *much* did he gain?

## SEAT WORK.

1. Copy, and fill the blanks:

$$11 = 10 +$$

$$11 - 10 = 10 -$$

$$11 - 6 = 6 -$$

$$11 = 7 +$$

$$11 = 5 +$$

$$11 = 3 +$$

$$11 = 8 +$$

$$11 = 2 +$$

$$11 = 6 +$$

$$11 = 4 +$$

$$11 = \quad + 3.$$

$$\frac{1}{2} \text{ of } 10 =$$

$$\frac{1}{2} \text{ of } 10 \text{ in.} = 5$$

$$\frac{1}{2} \text{ of } 11 \text{ in.} = \quad \text{in.}$$

$$10 + \quad = 11.$$

$$5 + 3 + 2 + \quad = 11.$$

$$3 \text{ ft.} =$$

$$11 \text{ ft.} - 3 \text{ ft.} = \quad \text{ft.}$$

$$3 \text{ yd.} = \quad \text{ft.}$$

$$11 \text{ ft.} - 9 \text{ ft.} = \quad \text{ft.}$$

$$11 \text{ ft.} - \quad \text{yd.} = 2 \text{ ft.}$$

$$5 + 5 =$$

$$\frac{1}{2} + \frac{1}{2} =$$

$$5\frac{1}{2} + 5\frac{1}{2} =$$

$$\frac{1}{2} \text{ of } 11 =$$

$$\frac{1}{2} \text{ of } 10 =$$

$$\frac{1}{2} \text{ of } 9 =$$

$$\frac{1}{2} \text{ of } 8 =$$

$$\frac{1}{2} \text{ of } 7 =$$

## THE NUMBER TWELVE.

## CLASS WORK.

1. Count twelve.
2. Twelve is how many more than 10?
3. Is 12 an odd number, or an even?
4. Take 12 steps forward; backward.
5. Make 12 lines.
6. Measure 12 pints of water.
7. Put 12 cents on the table.
8. Lay 12 sticks on your desks.
9. Twelve is how many more than 9? 5? 7? 3? 4? 8? 6? 2?
10. What number is 7 less than 12?
11. What number is 5 less than 12?
12. What number is 4 less than 12?
13. What number is 8 less than 12?
14. What number is  $\frac{1}{2}$  of 12?
15. What number is  $\frac{1}{3}$  of 12?
16. How much greater is  $\frac{1}{2}$  of 12 than  $\frac{1}{3}$  of 12?
17. How many 2's make 12? How many 3's? How many 4's? How many 6's?

## SEAT WORK.

1. Write these words:

*Ten. Eleven. Twelve.*

2. Write all the even numbers from 2 to 12.

3. Copy, and fill the blanks:

$$12 = + 9.$$

$$12 = + 5.$$

$$12 = + 7.$$

$$12 = + 3.$$

$$12 = + 4.$$

$$12 = + 8.$$

$$12 = + 6.$$

$$12 = + 2.$$

$$12 - 7 =$$

$$12 - 5 =$$

$$12 - 3 =$$

$$12 - 9 =$$

$$12 - 4 =$$

$$2 + 2 + 2 + 2 + 2 + 2 =$$

$$3 + 3 + 3 + 3 =$$

$$4 + 4 + 4 =$$

$$6 + 6 =$$

$$3 + 3 + 3 + 3 = 4 + 4 +$$

$$3 + 3 + 3 = 12 -$$

$$3 + 3 = 12 -$$

$$4 + 4 = 12 -$$

$$5 + 5 = 12 -$$

$$\frac{1}{2} \text{ of } 12 - \frac{1}{3} \text{ of } 12 =$$

## CLASS WORK.

1. Eleven inches lacks how much of 1 foot?

2. How many inches, then, in 1 foot?

3. How many inches in  $\frac{1}{2}$  foot?

4. How many inches in  $\frac{1}{4}$  foot?

5. Draw a line 1 ft. long.

6. Divide it into 12 equal parts; into 6 equal parts; into 4 equal parts; into 3 equal parts; into 2 equal parts.

7. How many inches in each part?

8. Measure 12 feet in length.

9. How many yards in 12 feet?

10. Measure a line 12 inches long.

11. Measure another line 12 times as long.

12. Draw a square foot.

13. Draw an oblong composed of 12 square feet.

14. Measure the height of the window; of the door; of the ceiling.

*Give many such exercises as those indicated above.*

## SEAT WORK.

1. Write, and remember this:  
*Twelve Inches = One Foot.*

2. Mark with great care upon your rulers lines dividing them into inches.

3. Cut a strip of paper  $\frac{1}{2}$  foot long.

4. Cut a strip of paper  $\frac{1}{4}$  foot long.

5. Cut a strip of paper  $\frac{1}{3}$  foot long.

6. Draw a square inch.

7. Draw twelve square inches in a row.

8. Draw a square  $\frac{1}{2}$  foot.

9. Divide the square  $\frac{1}{2}$  foot into square inches.

10. Write this:

Twelve inches = One foot.

Three feet = One yard.

11. Write answers to these questions:

If 4 oranges cost 12 cents, how much does 1 orange cost?

If 1 foot of rubber pipe costs 10 cents, how many inches of the pipe can be bought for 5 cents?

What will 3 yards of ribbon cost at 4 cents a yard?

## CLASS WORK.

1. Learn, and remember this:  
*Twelve Things = One Dozen.*
2. How many things in  $\frac{1}{2}$  dozen?
3. How many things in  $\frac{1}{4}$  dozen?
4. If 1 dozen marbles cost 10 cents, what will  $\frac{1}{2}$  dozen cost?
5. A dozen is how many more than ten?
6. A half-dozen is how many less than ten?
7. How many yards in a dozen feet?
8. What part of a dozen is 3?
9. John bought a dozen eggs, and sold 3. How many had he left? What part of the dozen did he sell?
10. At 6 cents a dozen, what will half a dozen cakes cost?
11. If buttons cost 3 cents a dozen, how many buttons can you buy for 1 cent? How many dozen buttons for 6 cents? How many for 12 cents?
12. Frank bought  $\frac{1}{2}$  dozen apples of one woman, and  $\frac{1}{4}$  dozen of another. How many did he buy of both?

## SEAT WORK.

1. Write this:

*Dozen = doz.  
Twelve Things =  
One Dozen.*

2. Copy, and fill the blanks:

$$\frac{1}{2} \text{ doz.} =$$

$$\frac{1}{4} \text{ doz.} =$$

$$12 - 10 =$$

$$10 - 6 =$$

$$12 \text{ ft.} = \text{ yd.}$$

$$\frac{1}{4} \text{ doz. ft.} = \text{ ft.}$$

3. Write three questions, using the word *dozen*.

4. Put  $\frac{1}{2}$  dozen sticks in one pile,  $\frac{1}{4}$  dozen in another, and  $\frac{1}{4}$  dozen in another.

5. How many triangles can you make with a dozen sticks? with  $\frac{1}{2}$  dozen? with  $\frac{1}{4}$  dozen? with  $\frac{1}{8}$  dozen? Try it, and see.

6. Draw a rectangle 6 inches long and 2 inches wide.

7. Divide it into square inches.

8. If you can get 2 apples for a cent, how much must you pay for a dozen apples?

*Continue daily systematic practice in ready addition, from table of numbers written on the blackboard, or placed in conspicuous position elsewhere. For method of using, see Lesson XXX., Step Second.*

1	9	2	8	4	1	5	3	4	1	2	1
4	3	8	1	6	1	2	4	8	2	3	3
2	8	3	9	3	9	2	5	4	9	1	2
5	4	7	3	7	2	6	6	2	1	9	1
3	7	2	5	2	1	3	1	9	2	2	8
6	5	6	5	8	8	3	3	3	8	3	2
4	6	1	2	1	3	7	5	7	1	1	3
7	6	5	2	9	1	4	7	5	2	8	1
5	4	2	4	3	7	4	2	5	7	2	7
1	2	2	3	8	4	8	4	3	1	3	2
6	2	4	5	2	1	1	6	2	2	1	3
3	5	4	7	9	6	2	1	9	6	7	3

*Revise the table constantly, but let the sum of no two numbers exceed the number being studied.*

## CLASS WORK.

## Buying and Selling.

1. John sells 12 quarts of vinegar. How many gallons?

2. Frank buys 12 quarts of molasses, at \$1 a gallon. What did he pay for it?

3. How many quarts in 12 pints?

4. How many gallons in 12 pints?

5. If one gallon of milk costs 1 dime, how much will 10 gallons cost?

6. Ten dimes = what?

7. Twelve dimes are how much more than a dollar?

8. If 1 quart of buttermilk costs 4 cents, what will 3 quarts cost?

9. James bought 12 marbles at 1 cent each. He sold half of them at 2 cents each, and lost the rest. What had he then? Did he gain or lose?

10. Anna bought 2 feet of ribbon for 6 cents. What would a yard cost at the same rate? How much could she have bought for 12 cents?

*Let the children buy and sell.*

## SEAT WORK.

1. Copy, and fill the blanks:

$$\frac{1}{2} \text{ of } 12 =$$

$$\frac{1}{4} \text{ of } 12 =$$

$$\frac{1}{8} \text{ of } 12 =$$

$$2 \times = 12.$$

$$3 \times = 12.$$

$$4 \times = 12.$$

$$6 \times = 12.$$

$$\frac{1}{2} \text{ of } 12 \text{ qts.} = \text{ qts.}$$

$$\frac{1}{2} \text{ of } 12 \text{ pts.} = \text{ pts.}$$

$$\frac{1}{2} \text{ of } 12 \text{ pts.} = \text{ qts.}$$

2. Copy, and fill the blanks:

$$2) \underline{12}$$

$$3) \underline{12}$$

$$4) \underline{12}$$

$$6) \underline{12}$$

$$5) \underline{10}$$

$$3) \underline{9}$$

3. Write five questions like those in the first column, and give the answer to each.

4. Draw a rectangle 6 inches long and 2 inches wide.

5. Draw another rectangle 4 inches long and 3 inches wide.

6. How many square inches in each of these rectangles?

7. Draw twelve parallel vertical lines, each 1 inch long. Draw twelve parallel horizontal lines of the same length.

## CLASS WORK.

1. What numbers will exactly divide 12?

2. What numbers will exactly divide 10? 9? 8? 6?

3. How many pecks of apples in 3 bushels?

4. A grocer bought 3 bushels of apples at 3 dollars a bushel. What did they cost?

5. He sold them at one dollar a peck. What did he get for them?

6. How much did he gain on the apples?

7. In 12 half-pecks how many pecks?

8. If a half-dozen eggs cost 12 cents, what is the cost per egg?

9. How many quarts of milk in 3 gallons?

10. How many quarts of milk in 12 pints?

11. If a dozen chickens cost 6 dollars, what does  $\frac{1}{2}$  dozen cost?

12. If 6 lemons cost 4 cents, what do 12 lemons cost?

*Make up many other questions similar to the above.*

## SEAT WORK.

1. Write five questions similar to those in the first column.

2. With 12 sticks, how many separate squares can you make?

3. How many triangles?

4. Add these columns:

2	1	5	7	4	3
4	4	2	2	1	2
3	3	1	1	2	2
3	2	3	2	4	4

5. Write all the even numbers from 2 to 12.

6. Write all the odd numbers less than 12.

7. Write answers to the following:

$$2 \overline{)12} \qquad 3 \overline{)12}$$

$$4 \overline{)12} \qquad 6 \overline{)12}$$

$$\frac{1}{2} \text{ of } 12 =$$

$$\frac{1}{3} \text{ of } 12 =$$

$$\frac{1}{4} \text{ of } 12 =$$

$$\frac{1}{5} \text{ of } 10 =$$

$$\frac{1}{6} \text{ of } 10 =$$

$$\frac{1}{7} \text{ of } 9 =$$

$$\frac{1}{8} \text{ of } 8 =$$

$$\frac{1}{9} \text{ of } 8 =$$

$$\frac{1}{10} \text{ of } 6 =$$



## CLASS WORK.

1. Draw a square yard.
2. Divide it into square feet.
3. How many square feet in 1 sq. yd.?
4. Place 3 more square feet at the bottom of the figure representing one square yard.
5. How many square feet have you now in the entire figure?
6. What is the figure called? Why not a *square*?
7. What is its length? its width?
8. Erase the lines within; then write its name and dimensions inside.
9. How many square feet in a flower-bed 2 feet wide and 4 feet long?
10. How many feet around the edge of such a flower-bed?
11. How many flowers one foot apart can you plant in it?
12. If you should make it one foot wider, how many square feet would it then contain?

*Extend these exercises, and if necessary continue their study for several days.*

## SEAT WORK.

1. Draw a rectangle 4 inches long and 3 inches wide.
2. Divide this rectangle into square inches.
3. Draw another rectangle 6 inches long, but containing the same number of square inches.
4. Multiply these figures:

$$\begin{array}{r} 3 \quad 2 \quad 3 \quad 4 \quad 3 \\ 4 \quad 5 \quad 3 \quad 2 \quad 2 \\ \hline \end{array}$$

5. Draw a figure 3 inches square.
6. Divide it into square inches.
7. Add 3 square inches to one side of this square.
8. Write the name and size of the new figure thus formed.
9. Draw a small rectangle.
10. Draw a right triangle having about half the area of the rectangle.
11. Write what you know about pints, quarts, and gallons.
12. Write what you know about inches, feet, and yards.
13. Write a question about square feet and square yards. Draw a figure to illustrate.

## CLASS WORK.

1. Learn this:  
Twelve Months = One Year.
2. Name the months, counting as you name.
3. How many months in half a year?
4. How many months in one of the seasons?
5. How many seasons are there?
6. What part of the year is the season of spring? What part is summer? What part is fall? What part is winter?
7. Twelve days are how much more than a week?
8. Twelve work-days are how many weeks?
9. If two boys can do a piece of work in 12 days, how long will it take 4 boys to do the same?
10. Twelve weeks are how many months?
11. How many hours from noon till midnight? How many from midnight till noon?
12. How many months from January to August? How many from April to December?

## SEAT WORK.

1. Write the names of all the months in the year.
2. Write the names of the seasons.
3. Write the names of the days of the week.
4. Write the name of the present month.
5. Write the name of the month which occurs one year from now.
6. Write the name of the day which occurs twelve days from this.
7. Learn this:  

January	is the	first	month.
February	"	second	"
March	"	third	"
April	"	fourth	"
May	"	fifth	"
June	"	sixth	"
July	"	seventh	"
August	"	eighth	"
September	"	ninth	"
October	"	tenth	"
November	"	eleventh	"
December	"	twelfth	"
8. Write the foregoing on your slates, neatly and accurately.

## THE NUMBER THIRTEEN.

## CLASS WORK.

1. Write the number,

13

2. Of how many figures is it, and what does each show?

3. How many must be added to 10 to make 13?

4. What two numbers added together make thirteen?

5. What three numbers added together make 13?

6. George has two pieces of money which together make 13 cents. What are they?

7. Thirteen cents is how much more than one dime?

8. Thirteen is how much more than 6? than 3? than 9? than 11?

9. Thirteen is how much more than one dozen?

10. Thirteen feet is how much more than 9 ft.?

11. Thirteen feet is how much more than 3 yd.? How much more than 4 yd.? How much more than 2 yd.?

12. Take 13 steps forward. Now take 13 steps backward.

## SEAT WORK.

1. Copy these, and if you have not already memorized them, do so now:

$$2 \times 6 = 12.$$

$$2 \times 4 = 8.$$

$$2 \times 2 = 4.$$

$$2 \times 5 = 10.$$

$$2 \times 3 = 6.$$

$$2 \times 1 = 2.$$

$$3 \times 4 = 12.$$

$$3 \times 2 = 6.$$

$$3 \times 3 = 9.$$

$$3 \times 1 = 3.$$

$$4 \times 3 = 12.$$

$$4 \times 1 = 4.$$

$$4 \times 2 = 8.$$

2. Copy, and fill the blanks:

$$10 + \quad = 13.$$

$$10 = 13 -$$

$$4 \times 3 + \quad = 13.$$

$$\frac{1}{2} \text{ of } 12 =$$

$$\frac{1}{2} \text{ of } 13 =$$

$$\frac{1}{3} \text{ of } 12 =$$

$$\frac{1}{3} \text{ of } 13 =$$

$$\frac{1}{4} \text{ of } 10 =$$

$$\frac{1}{4} \text{ of } 11 =$$

$$\frac{1}{4} \text{ of } 9 =$$

$$\frac{1}{4} \text{ of } 8 =$$

## CLASS WORK.

1. What two numbers multiplied together make 12?

$$6 \times 2 = \quad 4 \times 3 =$$

2. What two numbers multiplied together make 10?

$$5 \times 2 =$$

3. What two numbers multiplied together make 9?

$$3 \times 3 =$$

4. What three numbers make 12?

$$2 \times 2 \times 3 =$$

5. What three numbers make 8?

$$2 \times 2 \times 2 =$$

6. What two numbers multiplied together make 11? 7? 13? 5? (*Ans.* No two numbers multiplied together make 11, unless we say  $11 \times 1 = 11$ .)

When a number is made up of two or more other numbers multiplied together, as in the case of 4, 6, 9, etc., it is called a **Composite Number**.

All numbers not so composed, as 5, 11, 13, etc., are called **Prime Numbers**.

Write the words *Prime*, *Composite*.

## SEAT WORK.

1. Write all the prime numbers you have learned.

2. Write all the composite numbers you have learned, and show how each is composed, as,

$$12 = \begin{cases} 2 \times 2 \times 3 \\ 3 \times 4 \\ 2 \times 6 \end{cases}$$

$$9 = 3 \times 3, \text{ etc.}$$

3. Write all the odd numbers to 13.

4. Write all the even numbers to 12.

5. Write these words:

Composite Number.

Prime Number.

Even Number.

Odd Number.

6. Mark all the numbers below 13 which are both composite and odd.

7. Mark all the numbers below 13 which are both prime and even.

8. Draw two rectangles, each 2 in. by 3 in., joining them on one side.

9. Erase the line between them. What is the new rectangle you have thus formed?

## CLASS WORK.

1. Harry has eight cents, and Anna has half as many. How much money have both together?

2. If 3 yards of tape cost 6 cents, what will one yard cost? What will 6 yards cost?

3. Robert had 13 cents; he spent 3 cents for candy, 5 cents for paper, and the rest for a ball. What did the ball cost?

4. Alma is 12 years old, and Ida is half as old. How old is Ida?

*Make up many other questions similar to these.*

## SEAT WORK.

1. Write four questions similar to those in the first column.

2.  $8 + \frac{1}{2}$  of 8 = how many?

3.  $3 \overline{)6}$

4.  $6 \times 2 = 13 -$

5.  $13 - 3 - 5 =$

6.  $3 \overline{)12}$                       4) 12

7. Draw a rectangle 4 inches long and 3 inches wide.

8. Find its area in-square inches.

9. Divide it into two equal triangles.

10. What is the area (in square inches) of each triangle?

## STEP THIRD.—LESSON XV.

*Let the pupils have abundant practice in buying, selling, and making change.*

*But let no transactions for the present contain higher numbers than those which have been studied.*

*Try to have the pupils acquire quickness of perception as well as accuracy.*

*Shun formalities and rules merely as such. Let all work be, so far as possible, practical work, bringing into action the perceptive faculties and the ingenuity of the pupils.*

*Let them ask each other questions involving the principles thus far learned.*

## THE NUMBER FOURTEEN.

## CLASS WORK.

1. Count fourteen.
2. Count from fourteen backwards.

3. How many tens in fourteen?

4. Write the number fourteen (14) and tell what each figure means.

5. Beginning with 2, count to 14 by 2's.

6. Beginning with 14, count backward by 2's.

7. Count backward by 3's; by 4's.

8. Fourteen is how many more than 10? than 5? 3? 6? 4? 9? 7? 12? 2?

9. Is 14 an odd number?

10. Is 14 a composite number? Why?

11. Fourteen is how much more than one dozen?

12. What two numbers added together make 14? What three numbers? What four numbers?

13. One ten and four ones = what?  $10 + 4 =$  what?

$X + IV =$  what?

*Make up other questions.*

## SEAT WORK.

1. Write all the numbers from one to fourteen, in columns, thus:

One.	1.	I.
Two.	2.	II.

2. Count (write) to fourteen by 2's, thus: 2, 4, etc.

3. Name all the odd numbers below 14, beginning with one.

4. With 14 sticks, how many sets of parallel lines, 2 in a set, can be made?

5. With 14 sticks, how many separate triangles can be made?

6. Draw a rectangle 7 inches long and 2 inches wide.

7. Draw another rectangle  $3\frac{1}{2}$  inches wide and 4 inches long.

8. Which of these two rectangles is the larger?

9. What number must be added to each of these columns to make the sum equal 14?

4	3	2	1	6	3
3	2	1	4	2	4
2	1	4	5	1	3
1	2	5	3	2	4

## CLASS WORK.

1. Draw a line 14 inches long.

2. How much longer than one foot is it?

3. Find the middle of this line, and the length of each half.

4. Measure 14 feet.

5. How many yards in 14 feet?

6. Measure 14 yards.

7. Draw a rectangle 7 feet long and 2 feet wide.

8. What is the area of this rectangle?

9. If a garden-bed is 4 ft. long and 3 ft. wide, what is its area?

10. If it is 4 ft. long and  $3\frac{1}{2}$  ft. wide, what is its area?

11. I have a flower-bed 3 ft. wide and 4 ft. long. How many feet around it?

12. Measure the distance around your slate; your desk.

13. Here are some cards. Measure the distance around them.

14. Cut each into two equal parts. Now measure it.

## SEAT WORK.

1. With 14 sticks, how many separate squares can be made?

2.  $\frac{1}{4}$  of 14 =

3.  $\frac{1}{2}$  of 14 =

4.  $3 \overline{)14}$

5.  $2 \times \frac{1}{2} =$

$2 \times 1\frac{1}{2} =$

$2 \times 2\frac{1}{2} =$

$2 \times 3\frac{1}{2} =$

6.  $4 \times \frac{1}{2} =$

$4 \times 1\frac{1}{2} =$

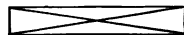
$4 \times 2\frac{1}{2} =$

$4 \times 3\frac{1}{2} =$

7. Draw a rectangle 2 inches wide and 7 inches long.

8. Divide it into 2 equal triangles.

9. Divide it into 4 triangles, by drawing lines, thus :



10. Draw a rectangle 3 inches wide and 4 inches long. Measure the distance around it.

11. Draw a triangle, two of whose sides shall be 6 inches each, and the other 2 inches. Measure the distance around it.

## CLASS WORK.

1. A milkman sold 3 qts. of milk to one customer, 7 qts. to another, and 4 qts. to another. How many gallons did he sell?

2. How many pints in 6 quarts? in 7 quarts?

3. At 3 cents a pint, what will one quart of vinegar cost?

4. What will half a gallon cost?

5. At 14 cents per gallon, what will 1 qt. of buttermilk cost?

6. What will 1 bushel of lemons cost, at 1 dollar per peck? at  $1\frac{1}{2}$  dollars per peck?

7. In 14 pints how many quarts?

8. Measure the length and the breadth of the school-room.

9. If from 14 feet you take 1 yard, how much remains? How much if you take 2 yards?

10. If from 14 inches you take 1 foot, how many inches are left?

*Devote several lessons to exercises similar to the above. Let the pupils do the actual measuring.*

## SEAT WORK.

1. Write three questions similar to those in the first column.

2. Copy, and fill the blanks:

$$14 = 10 +$$

$$14 = 12 +$$

$$14 = 3 +$$

$$14 = 9 +$$

$$14 = 2 +$$

$$14 = 8 +$$

$$14 = 4 +$$

$$14 = 7 +$$

$$14 = 6 +$$

$$14 = 5 +$$

$$14 = 2 \times 5 +$$

$$14 = 3 \times 3 +$$

$$14 = 3 + 4 \times$$

$$\frac{1}{2} \text{ of } 14 =$$

$$14 \text{ in.} = 1 \text{ ft.} + \text{ in.}$$

$$14 \text{ ft.} = \text{ yd.} + \text{ ft.}$$

3. Draw two parallel lines, both of which together = 14 in.

4. Draw 4 such parallel lines.

5. Draw 3 square inches.

6. Divide each of these squares into 4 equal parts.

7. Divide each of these 4 equal parts into 2 triangles.

8. Into how many triangles have you divided the square inch?



## CLASS WORK.

1. How many 2-cent postage stamps can you buy for 14 cents?

2. Name 5 pieces of money which together make 14 cents.

3. John has a dime, and Frank has 14 cents. Which has the most, and how much?

4. Frank's money consists of two half-dimes and two other pieces. What are the other pieces?

5. Mr. Brown bought 3 lambs at 3 dollars each, and a pig for 5 dollars. What did all cost?

6. He paid for them with three bills. What were they?

7. Mary bought a dozen eggs, but broke half of them. How many remained unbroken?

8. She sold those that remained for 12 cents. How much was that apiece?

9. Henry received \$2 a day for a week's work. How much did he get?

10. He spent \$5 of it for board. How much had he left?

*Make up other questions like the above.*

## SEAT WORK.

1. Write four questions similar to those in the first column. Write answers to them.

2. Copy, and fill the blanks:

$$2)14$$

$$7)14$$

$$2 \times = 14.$$

$$3 \times = 12.$$

$$4 \times = 8.$$

$$6 \times = 12.$$

$$2 \times = 6.$$

$$7 \times = 14.$$

$$3 \times 3 =$$

$$3 \times 3 + 5 =$$

$$10 + 2 + = 14.$$

3. Write the name of to-day, and of every day following for two weeks.

4. Write the name of this month and of the coming seven months.

5. A year is how much less than 14 months?

6. Draw a line  $\frac{1}{2}$  of 14 inches long.

7. Draw another line  $\frac{1}{2}$  as long as this.

8. What 4 sticks, all of different lengths, are together equal to 14 inches?

## CLASS WORK.

1. Fourteen days are how many weeks?
2. How many months in 14 weeks?
3. Fourteen months are how much more than one year?
4. Clara is 14 years old, and Bessie is half as old. How old is Bessie?
5. How many work-days in 2 weeks?
6. How many school-days in 2 weeks?
7. If a man earn 1 dollar a day, how much will he earn in 2 weeks?
8. If board costs  $3\frac{1}{2}$  dollars a week, what will one month's board cost?
9. Three and one-half dollars a week is how much a day?
10. If a man earn 2 dollars a day, how long will it take him to earn 14 dollars?
11. John gave 7 dollars for 14 bushels of apples. How many bushels does he get for a dollar?
12. If he sold them for 14 dollars, how much did he gain?

## SEAT WORK.

1. Copy, and fill the blanks:

$$7)14 \qquad 4)14$$

$$14 = 12 +$$

$$\frac{1}{2} \text{ of } 14 =$$

$$2 \times 6 =$$

$$2 \times 5 =$$

$$\frac{1}{2} \text{ of } 12 =$$

$$\frac{1}{2} \text{ of } 14 - \frac{1}{2} \text{ of } 12 =$$

2. Draw a rectangle 14 inches long and 1 inch wide.

3. Divide it into square inches.

4. Draw a rectangle 7 inches long and 2 inches wide.

5. Divide it into square inches.

6. Memorize this:

$$7 \times 2 = 14.$$

$$2 \times 7 = 14.$$

7	6	5	4	3	2
<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>
14	14	14	14	14	14

12	11	10	9	8	7
<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
14	14	14	14	14	14

7. Write five questions like those in the first column, and write also their answers.

## THE NUMBER FIFTEEN.

## CLASS WORK.

1. Count fifteen.
  2. Is 15 an odd number?
  3. Name all the odd numbers to 15.
  4. Name all the even numbers to 15.
  5. Is 15 a composite number? What numbers or factors compose it?
  6. Name all the composite numbers to 15.
  7. What is  $\frac{1}{2}$  of 10?
  8. To 10 add  $\frac{1}{2}$  of 10.
  9. Fifteen is how many more than 10?
  10.  $\frac{1}{3}$  of 15 = what?
  11.  $\frac{2}{3}$  of 15 = what?
  12. Ten is what part of 15?
  13. What two different numbers added together make 15?
  14. What three different numbers added together make 15?
  15. What five numbers, all the same, make 15 when added together.
- $10 + 5 = \text{what?}$   $X + V = \text{what?}$

*Illustrate all the above by concrete examples.*

## SEAT WORK.

1. Write all the numbers to 15 in three different ways, thus:

One.      1.      I.  
Two.      2.      II.

2. Write all the odd numbers to 15.

3. Write all the prime numbers below 15.

4.  $\frac{1}{3}$  of 15 =

5.  $\frac{1}{4}$  of 15 =

6.  $\frac{1}{5}$  of 15 =

7.  $15 = \times 5$ .

8.  $3 \overline{)15}$        $5 \overline{)15}$

9.  $3 + 6 + = 15$ .

10.  $15 - 3 - 6 =$

11. What two numbers added together make 15? Write them thus:

$7 + 8 = 15$ .

$3 + 12 = 15$ .

etc. etc.

12. What three numbers added together make 15? Write them in the same way:

$3 + 4 + 8 = 15$ .

etc. etc.

13. Write three questions similar to those in the first column.

## CLASS WORK.

1. How many cents in one half-dime?

2. How many half-dimes in 15 cents?

3. How many half-eagles in 15 dollars? What is a half-eagle?

4. How many dollars = a quarter-eagle?

5. How many quarter-eagles = 5 dollars?

6. How many 3-cent pieces = 15 cents?

7. What three pieces of money, all alike, together make 15 cents?

8. What three pieces of money, all different, together make 15 cents?

9. What is the smallest number of bills, all alike, that together make \$15?

10. John had 15 cents; he bought a pencil for 4 cents, a pen for 2 cents, and a note-book for 5 cents. How much had he left?

11. A milkman sells 2 quarts of milk to A, 5 quarts to B, 3 quarts to C, and 3 pints to D. *How much does he sell to all?*

## SEAT WORK.

1. Write, in full, the words for which the following abbreviations stand:

\$	=	yd.	=
ct.	=	ft.	=
gal.	=	in.	=
qt.	=	yr.	=
pt.	=	mo.	=
bu.	=	wk.	=
pk.	=	da.	=

2. Write the names of all the pieces of money you have learned, together with the material of which each is made, thus:

One Cent, — Copper.

3. Write answers to these questions:

(a) How many lead-pencils at 5 cents each can be bought for 15 cents?

(b) How many pens at 3 cents each can be bought for the same amount?

(c) How many gallons of water can be put into a pail which holds 15 quarts?

(d) How many yards in a string 15 feet long?

## CLASS WORK.

1. Measure a line 15 inches long.
2. How much more than a foot long is this line?
3. How many inches in  $\frac{1}{2}$  foot? in  $\frac{1}{4}$  foot?
4. How many inches equal  $1\frac{1}{4}$  feet?
5. Divide your 15-inch line into halves. What is the half of 15?
6. Divide it into thirds.  
 $\frac{1}{3}$  of 15 in. = in.
7. John may measure a line 15 ft. long. Anna may measure one 5 yards long.
8. Which line is the longer? 15 ft. = how many yards?
9. Measure 15 yards.
10. Each pupil may cut a string just 5 yards long.
11. Draw a square 15-inches.
12. Draw a square inch.
13. Draw a rectangle 15 inches long and one inch wide.
14. Divide this rectangle into square inches. How many?
15. How many such rectangles would be required to equal the square 15-inches first drawn?

## SEAT WORK.

1. Add these columns :

2	4			
3	1	6	5	4
2	4	3	2	3
3	1	1	2	1
2	4	2	1	2
3	1	2	3	4
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

2. Multiply the upper number by the lower :

5	4	7	5	6
2	3	2	3	2
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

3. From the upper number take the lower :

14	15	13	12	15
6	7	8	9	6
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

4. Copy, and fill the blanks :

1 ft. = in.  
 $\frac{1}{2}$  ft. = in.  
 $\frac{1}{4}$  ft. = in.  
 $1\frac{1}{4}$  ft. = in.  
 $\frac{1}{2}$  of 15 in. = in.  
 $\frac{1}{3}$  of 15 in. = in.

5. Draw lines as follows :

One  $\frac{1}{2}$  ft. long.  
 One  $\frac{1}{4}$  ft. long.  
 One  $\frac{1}{3}$  ft. long.  
 One  $\frac{1}{3}$  of 15 in. long.

## CLASS WORK.

## Review of Liquid Measure.

1. How many quarts in 15 pints?
2. How many gallons, quarts, and pints in 15 pints?
3. How many gallons and quarts in 15 quarts?
4. One quart = what part of a gallon?
5. Three quarts = what part of a gallon?
6.  $3\frac{1}{4}$  gal. = qt.
7. At 2 cents a pint, what cost 3 qt. of syrup?
8. At 2 cents a pint, what cost 3 qt. of syrup?
9. If 3 gal. of varnish cost \$15, what costs one gallon?
10. What costs 1 quart?
11. What will 7 gallons of oil cost at \$2 a gallon?
12. How many pints = 7 quarts? How many gallons = 7 quarts?
13. If a pint of water weighs one pound, how much does a gallon weigh?

*Illustrate all such questions.  
Ask many more of a like character.*

## SEAT WORK.

## 1. Memorize this:

$2 \times 2 = 4.$

$2 \times 3 = 6.$

$2 \times 4 = 8.$

$2 \times 5 = 10.$

$2 \times 6 = 12.$

$2 \times 7 = 14.$

$3 \times 2 = 6.$

$3 \times 3 = 9.$

$3 \times 4 = 12.$

$3 \times 5 = 15.$

$4 \times 2 = 8.$

$4 \times 3 = 12.$

$5 \times 2 = 10.$

$5 \times 3 = 15.$

$6 \times 2 = 12.$

$7 \times 2 = 14.$

## 2. Copy, and fill the blanks:

$\frac{1}{2}$  of 2 = 1.

$\frac{1}{2}$  of 3 =

$\frac{1}{2}$  of 4 =

$\frac{1}{2}$  of 5 =

$\frac{1}{2}$  of 10 =

$\frac{1}{2}$  of 11 =

$\frac{1}{2}$  of 13 =

$\frac{1}{2}$  of 14 =

$\frac{1}{2}$  of 15 =

$\frac{1}{3}$  of 15 =

## CLASS WORK.

## Review of Dry Measure.

1. If 5 bushels of apples cost \$10, what will 1 bushel cost?
2. What will 7 bu. cost?
3. What will  $\frac{1}{2}$  bu. cost?
4. If 2 pecks cost \$1, what will  $\frac{1}{2}$  pk. cost?
5. How many bushels in 4 pk.? in 15 pk.?
6.  $\frac{1}{4}$  of 15 = what?
7. How many quarts in 1 pk.?
8. Fifteen quarts = how many pecks?
9. A farmer received \$15 for 5 bu. of fruit. How much was that per bushel?
10. How many 2-bushel sacks will be required to hold 15 bushels of wheat? How many to hold 12 bushels?
11. How many peck baskets will be required to hold 2 bushels of potatoes?
12. At 3 cents a half-peck, how many pecks of chaff can be bought for 12 cents?
13. How many pecks in 7 half-bushels?

*Illustrate, and ask many more questions.*

## SEAT WORK.

1. Copy, and fill the blanks from memory :

$$5 \times 3 =$$

$$2 \times 4 =$$

$$3 \times 4 =$$

$$2 \times 5 =$$

$$3 \times 5 =$$

$$2 \text{ pt.} = \text{qt.}$$

$$\text{qt.} = 1 \text{ gal.}$$

$$\text{qt.} = 1 \text{ pk.}$$

$$4 \text{ dry gal.} = \text{pk.}$$

$$\text{pk.} = 1 \text{ bu.}$$

$$12 \text{ in.} = \text{ft.}$$

$$\text{in.} = \frac{1}{2} \text{ ft.}$$

$$\text{in.} = 1\frac{1}{2} \text{ ft.}$$

$$\text{cts.} = 1 \text{ dime.}$$

$$\text{d.} = 1 \text{ dollar.}$$

$$\text{\$} = 1 \text{ eagle.}$$

$$\frac{1}{2} \text{ of } \$10 = \$$$

$$7 \times \$2 =$$

$$\frac{1}{2} \text{ of } \$2 =$$

$$\frac{1}{2} \text{ of } \$ = \$\frac{1}{2}.$$

$$4 \overline{)15}$$

$$\frac{1}{2} \text{ of } 15.$$

$$5 \overline{)15}$$

$$2 \overline{)15}$$

2. Write the names of all the things you think of that are sold by the bushel or by the peck.

## CLASS WORK.

## Time.

1. How many weeks in 15 days?
2. In 15 school-days how many weeks?
3. How many months in one year? in  $\frac{1}{2}$  yr.? in  $\frac{1}{4}$  yr.?
4. Fifteen months is how much more than 1 year? Three months is what part of a year?
5. Nine months is what part of a year?
6. How many months in  $1\frac{1}{2}$  years?
7. How many weeks in 1 month? How many in  $\frac{1}{4}$  year?
8. How many in 2 months? in  $2\frac{1}{2}$  months?
9. How many months in 12 weeks? How many months in 15 weeks?
10. How many hours from 6 o'clock in the morning till noon?
11. How many hours from noon till 6 o'clock in the evening?
12. How many hours from 6 in the morning till 6 in the evening?

## SEAT WORK.

1. Copy, and fill the blanks:

$$7 \overline{)15} \qquad 5 \overline{)15}$$

- $\frac{1}{2}$  of 12 mo. =  
 $\frac{1}{4}$  of 1 yr. = mo.  
 12 mo. = yr.  
 3 mo. = yr.  
 15 mo. = 1 yr. + mo.  
 15 mo. = yr.  
 $\frac{1}{4}$  yr. = mo.  
 $1\frac{1}{2}$  yr. = mo.  
 9 mo. = yr.  
 $\frac{1}{2}$  yr. = mo.  
 $\frac{3}{4}$  yr. = mo.  
 $\frac{1}{4}$  yr. = mo.  
 $1\frac{1}{2}$  yr. = mo.  
 wk. = 1 mo.  
 wk. = 2 mo.  
 wk. = 3 mo.  
 wk. =  $\frac{1}{2}$  mo.  
 wk. =  $1\frac{1}{2}$  mo.  
 wk. =  $2\frac{1}{2}$  mo.  
 wk. =  $3\frac{1}{2}$  mo.  
 wk. =  $\frac{1}{4}$  mo.  
 wk. =  $1\frac{1}{4}$  mo.  
 wk. =  $2\frac{1}{4}$  mo.  
 wk. =  $3\frac{1}{4}$  mo.  
 12 wk. = mo.  
 3 wk. = mo.  
 15 wk. = mo.



*Give the pupils abundant practice in buying, selling, and making change. Encourage them constantly in making discoveries for themselves. Let them measure objects, in doors and out of doors. Continue daily the practice of rapid addition, at sight, from the chart and from columns of figures. Follow the motto: Quick and Accurate.*

**CLASS WORK.****Review, etc.**

*Review all the principles taught or involved in the preceding lessons in this Step.*

*Take especial care to illustrate every point not thoroughly understood by the class.*

*Ask practical questions in great variety.*

1. Lay off a flower-bed 4 ft. long and 3 ft. wide.

2. What is its area?

3. What is the distance round the outer edge?

4. How many rows of plants, one foot apart, and one foot from each edge, can be planted?

5. How many plants will there be in each row?

6. How many rows and how many plants would there be, if they were put only  $\frac{1}{2}$  foot apart?

7. How many if they were 2 feet apart, and 6 inches from each side?

**SEAT WORK.****Review.**

1. Copy, and fill the blanks:

$$15 = 2 \times$$

$$15 = 3 \times$$

$$15 = 5 \times$$

$$15 \text{ in.} = 1 \text{ ft.} + \text{ in.}$$

$$15 \text{ ft.} = \text{ yd.}$$

$$15 \text{ pt.} = \text{ qt.} + \text{ pt.}$$

$$15 \text{ qt.} = \text{ gal.} + \text{ qt.}$$

$$15 \text{ pk.} = \text{ bu.} + \text{ pk.}$$

$$15 \text{ cts.} = \text{ dime} + \text{ cts.}$$

$$15 \text{ dimes} = \$ + \text{ dimes.}$$

$$15 \text{ da.} = \text{ wk.} + \text{ da.}$$

$$15 \text{ wk.} = \text{ mo.} + \text{ wk.}$$

$$15 \text{ mo.} = \text{ yr.} + \text{ mo.}$$

2. Draw a rectangle 5 in. long and 3 in. wide.

3. Divide it into square inches.

4. Draw a right triangle, making the two shorter sides 3 inches and 4 inches.

5. Measure the longer line, and write its exact length.

## THE NUMBER SIXTEEN.

## CLASS WORK.

1. Count sixteen.
2. Count sixteen by 2's; by 4's.
3. How many tens in 16? How many ones?
4. Is 16 an odd number?
5. Name all the even numbers to 16.
6. Is 16 a prime number?
7. What two numbers multiplied together make 16? What other numbers?
8. Sixteen is how many more than 10?
9.  $\frac{1}{2}$  of 16 = what?
10.  $\frac{1}{4}$  of 16 = what?
11.  $\frac{1}{8}$  of 16 = what?
12. With 16 sticks, how many separate squares can you make?
13.  $\frac{1}{2}$  of 16 = how many more than  $\frac{1}{4}$  of 16?
14.  $\frac{1}{2}$  of 16 = how many more than  $\frac{1}{8}$  of 16?
15. Write the numbers from 1 to 16 with both figures and letters.

*Ask other questions, and illustrate each.*

## SEAT WORK.

1. Draw a square two-inches.
2. Divide it into square inches. How many?
3. Draw a square three-inches.
4. Divide it into square inches. How many?
5. Draw a square four-inches.
6. Divide it into square inches. How many?
7.  $2 \times 2 =$  how many?  
 $3 \times 3 =$  how many?  
 $4 \times 4 =$  how many?
8. Draw a rectangle 4 in. long and 1 in. wide. Divide it into square inches.
9. Draw three more rectangles like it.
10. How many squares can you make with 16 sticks? How many triangles?
11. Copy, and fill the blanks:  
 $\frac{1}{2}$  of 16 =  
 $\frac{1}{4}$  of 16 =  
 $\frac{1}{8}$  of 16 =  
 $\frac{3}{4}$  of 16 =  
 $\frac{1}{8}$  of 16 =  
 $\frac{2}{8}$  of 16 =  
 $\frac{3}{8}$  of 16 =

## CLASS WORK.

The number obtained by multiplying two numbers together is called the **Product**.

1. Multiply 8 by 2. What is the product?

2. What is the product of  $3 \times 4$ ? of  $2 \times 7$ ? of  $5 \times 2$ ? of  $4 \times 4$ ?

3. What is the area of a rectangle 6 in. long and 2 in. wide?  
(We may write it thus: 6 in.  $\times$  2 in.)

4. What is the area of a rectangle 3 ft.  $\times$  4 ft.?

5. What is the area of a rectangle 5 yd.  $\times$  2 yd.?

6. What is the area of a square 2 in.  $\times$  2 in.? of a square 3 in.  $\times$  3 in.? of a square 4 in.  $\times$  4 in.?

The product of a number multiplied by itself is called its **Square**. Thus, *nine* is the square of *three*.

7. What is the square of 4? What is the square of 2?

8. Four is how much more than 2? The square of 4 is how much more than the square of 2? It is how many times greater?

## SEAT WORK.

1. Copy these words:

*Product, Area, Square.*

2. The product of:

$$2 \times 4 =$$

$$3 \times 4 =$$

$$4 \times 4 =$$

$$2 \times 5 =$$

$$3 \times 5 =$$

$$2 \times 6 =$$

$$2 \times 7 =$$

$$2 \times 8 =$$

3. The area of a rectangle:

$$3 \text{ in.} \times 5 \text{ in.} = \text{sq. in.}$$

$$2 \text{ in.} \times 7 \text{ in.} =$$

$$4 \text{ ft.} \times 2 \text{ ft.} = \text{sq. ft.}$$

$$3 \text{ ft.} \times 2 \text{ ft.} =$$

$$2 \text{ yd.} \times 6 \text{ yd.} = \text{sq. yd.}$$

$$5 \text{ yd.} \times 2 \text{ yd.} = \text{sq. yd.}$$

*NOTE. Observe that in the above examples we do not actually multiply 3 in. by 5 in., etc. The numbers are so written for convenience, and the examples should be read, "3 inches in width by 5 inches in length," etc., and not as ordinary examples in multiplication.*

4. The square

$$\text{of } 2 = \quad \text{of } 3 = \quad \text{of } 4 =$$

## CLASS WORK.

1. Draw a square inch.
2. Draw a rectangle 16 inches long and 1 inch wide.
3. Divide it into square inches.
4. Draw a square 16-inches.
5. How many rectangles like that just drawn are equal to a square 16-inches?
6. Draw a square which shall contain 16 sq. in.
7. Draw a square which shall contain 9 sq. ft.
8. 9 sq. ft. = what?
9. Draw a square which shall contain 4 sq. in.
10. What is the square of 2? of 3? of 4?

The square of a number is indicated by a small figure to the right and a little above the given number; thus,  $2^2$  means "the square of 2."

*Go slowly, and do all work accurately. Some pupils will need help. While not refusing to aid them, teach them to help themselves. Let them see every process. Require them to perform every process.*

## SEAT WORK.

1. Draw a rectangle 8 in. by 2 in.
2. Divide it into square inches.
3. Draw a rectangle  $\frac{1}{2}$  foot long and 2 in. wide. Divide it into square inches.
4. Divide the above rectangle into two equal triangles.
5. Copy this:  
 The square of  $1 = 1^2 = 1$ .  
 The square of  $2 = 2^2 = 4$ .  
 The square of  $3 = 3^2 = 9$ .  
 The square of  $4 = 4^2 = 16$ .
6. Draw:  
 A square inch.  
 A square two-inches.  
 A square three-inches.  
 A square four-inches.
7. Find the area of each of the squares you have drawn.
8. Copy the following:  
 $2^2 - 1^2 = 4 - 1 = 3$ .  
 $3^2 - 2^2 = 9 - 4 = 5$ .  
 $4^2 - 3^2 = 16 - 9 = 7$ .  
 $2^2 - 1^2 = 2 + 1$ .  
 $3^2 - 2^2 = 3 + 2$ .  
 $4^2 - 3^2 = 4 + 3$ .  
 $4^2 = 4 \times 2^2$ .

## CLASS WORK.

1. Henry has 16 cents which he divides equally among 8 beggars. How many does he give to each?

2. John buys 4 note-books for 16 cents. How much did he pay for each?

3. Ella gives 3 cents for a spool of thread, 5 cents for a thimble, 4 cents for some pins, and has 3 cents left. How much had she at first?

4. Albert saw 16 birds in a tree. Nine of them were robins, and the rest wrens. How many wrens were there?

5. Oscar recited 4 times to-day, and in each recitation answered 4 questions. How many questions did he answer all together?

6. There were 16 peas in 2 pods. In one of the pods there were 5 peas; how many were in the other?

7. Mary sold 7 feet of ribbon to Anna, and 9 feet to Alice. How much did she sell to both?

*Make up many such questions.*

## SEAT WORK.

1. Write three questions like those in the first column.

2. What two numbers added together make 16?

Write them thus:

$$9 + 7 = 16, \text{ etc.}$$

3. What three numbers added together make 16?

Write them thus:

$$3 + 6 + 7 = 16, \text{ etc.}$$

4. What four numbers added together make 16?

Write them thus:

$$1 + 2 + 6 + 7 = 16, \text{ etc.}$$

5. What five numbers added together make 16?

6. Are there six different numbers which added together make 16?

7. Copy, and fill the blanks?

$$\frac{1}{8} \text{ of } 16 =$$

$$\frac{3}{8} \text{ of } 16 =$$

$$\frac{1}{4} \text{ of } 16 =$$

$$\frac{5}{8} \text{ of } 16 =$$

$$\frac{4}{8} \text{ of } 16 =$$

$$\frac{2}{4} \text{ of } 16 =$$

$$\frac{1}{2} \text{ of } 16 =$$

$$\frac{1}{2} \text{ of } 8 =$$

$$\frac{1}{4} \text{ of } 8 =$$

$$\frac{1}{8} \text{ of } 8 =$$

## CLASS WORK.

## Money.

1. Sixteen cents is how much more than one dime?
2. What three pieces of money, all different, are together equal to 16 cents?
3. What four pieces are together equal to 16 cents?
4. What is the smallest number of bills, all alike, that together make 16 dollars?
5. What is the smallest number of bills, all different, that together make 16 dollars?
6. How many 2-cent pieces = 16 cents?
7. One dime + how many 3-cent pieces = 16 cents?
8. One-half of 16 cents is how much more than  $\frac{1}{4}$  of 16 cents?
9. To  $\frac{1}{2}$  of 16 cents add  $\frac{1}{4}$  of 16 cents.
10. How many dollars and dimes in 16 dimes.
11. How many letters can you post for 16 cents?
12. How many different kinds of stamps can you buy for 16 cents?

## SEAT WORK.

1. Copy, and fill the blanks:  
 $16 \text{ cts.} = \text{dime} + \text{cts.}$   
 $10 \text{ cts.} + 5 \text{ cts.} + 1 \text{ ct.} =$   
 $3 \text{ cts.} + 10 \text{ cts.} + = 16 \text{ cts.}$   
 $1 \text{ ct.} + 2 \text{ cts.} + 3 \text{ cts.} + \text{cts.}$   
 $= 16 \text{ cts.}$   
 2) 16 cts.                      4) \$16  
 $3 + 3 + = 16.$   
 $\frac{1}{2} \text{ of } 16 =$   
 $\frac{1}{4} \text{ of } 16 =$   
 $\frac{1}{2} \text{ of } 16 + \frac{1}{4} \text{ of } 16 =$   
 $\frac{1}{2} \text{ of } 16 - \frac{1}{4} \text{ of } 16 =$   
 $\frac{3}{4} \text{ of } 16 =$
2. Draw a rectangle 8 inches long and 2 inches wide.
3. Draw a square 4-inches.
4. Which is larger, the square or the rectangle?
5. Draw a triangle having half the area of the square.
6. Learn this:  
 The area of a rectangle is equal to the product of its length multiplied by its width.
7. Draw a rectangle 3 in. wide and 5 in. long. Also a triangle 3 in. wide and 5 in. high. Now find the area of the square; also that of the triangle.

## CLASS WORK.

1. Draw a line 16 inches long.
2. How much more than a foot long is this line?
3. How many inches in  $\frac{1}{2}$  foot? in  $\frac{1}{4}$  foot?
4. Four inches = what part of a foot?
5.  $1\frac{1}{2}$  ft. = how many inches?
6. What is  $\frac{1}{4}$  of 16 inches? What is  $\frac{1}{8}$  of 16 inches?
7. Draw two parallel lines, one  $\frac{1}{4}$  of 16 inches in length, the other  $\frac{1}{8}$  of 16 inches in length.
8. How much longer is  $\frac{1}{4}$  of 16 inches than  $\frac{1}{8}$  of 16 inches?
9. Measure a line 16 feet long.
10. How many yards in this line?
11. Make a flower-bed 6 feet long and 2 feet broad.
12. How many square feet does it contain?
13. What is the distance around the edge?
14. What is the distance around the edge of a flower-bed 4 ft. long and 3 ft. broad?

## SEAT WORK.

1. Add these columns:

4	3	5	6	2
2	2	1	3	3
3	1	2	2	4
2	3	2	1	5
3	2	3	2	1
<u>2</u>	<u>4</u>	<u>2</u>	<u>2</u>	<u>1</u>

2. Add these numbers:

6	9	5	4	7	3	7
<u>5</u>	<u>6</u>	<u>9</u>	<u>12</u>	<u>7</u>	<u>11</u>	<u>8</u>
5	6	4	12	7	6	
<u>7</u>	<u>10</u>	<u>9</u>	<u>3</u>	<u>9</u>	<u>8</u>	

3. Multiply the upper number by the lower:

6	2	5	4	2
<u>2</u>	<u>8</u>	<u>3</u>	<u>4</u>	<u>7</u>

4. From the upper number take the lower:

16	15	14	13	12
<u>5</u>	<u>6</u>	<u>8</u>	<u>10</u>	<u>7</u>

5. Copy, and fill the blanks:

1 ft. = in.

$\frac{1}{2}$  ft. = in.

$1\frac{1}{2}$  ft. = in.

16 ft. = yd. + ft.

## CLASS WORK.

1. Here are some blocks, each side of which is a square. Measure each side.

(Pupils: Each side is one inch square.)

2. How many sides has each block?

(Pupils: Six.)

3. Anything which has six equal sides, all squares, is called a Cube.

4. We call these cubic inches, because each side is 1 inch square.

*Show pupils what is meant by face, edge, corner.*

5. Here are some larger cubes. Measure each side.

(Pupils: Each side is 2 inches square; and the area of each side is 4 square inches.)

6. We call these larger cubes cubic two-inches. What is the length of each edge?

7. How many faces has a cube? How many edges? How many corners?

8. Put 8 cubic inches together so as to form a larger cube.

9. Compare this larger cube *with a cubic two-inches.*

## SEAT WORK.

1. Cut a piece of paper containing a square inch.

2. Cut a piece containing a square two-inches.

3. Cut a piece containing a square three-inches.

4. Cut a piece containing a square four-inches.

5. Compare the sizes of these squares by answering these questions:

How much larger is the square two-inches than the square inch?

How much larger is the square three-inches than the square two-inches? than the square inch?

What part of a square two-inches is a square inch?

6. Copy the following:

Cube, Cubic inch.

Face, Edge, Corner.

Every cube has

Six Faces,

Eight Corners,

Twelve Edges.

7. Examine a cube and see if this is correct.



## CLASS WORK.

We will study cubes and cubical bodies a little further.

1. How many faces has a cube? how many edges? how many corners?

2. Here is a box. How many faces has it? edges? corners?

3. Albert may measure this face, and write its length and width on the blackboard.

4. John, in like manner, may measure this face.

5. Susan, in like manner, may measure this face.

We call such objects as these *cubical bodies*, because, although not cubes, they resemble them in having six faces, twelve edges, and eight corners. Each face is also a rectangle.

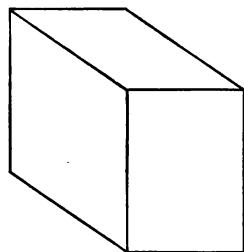
6. Name all the cubical bodies you can think of.

*Have a small wooden box, say about 1 ft.  $\times$  1 ft.  $\times$  2 ft. Let the children measure it and name the cubical contents as nearly as they can. Do not be particular about any excess of inches.*

*Let the pupils measure the dimensions of smaller boxes.*

## SEAT WORK.

1. Draw a picture of a cubical body.



2. Measure the length of each edge. Find the area of each face as nearly as you can.

3. Copy the following words:

*Cube.  
Cubical.  
Face.  
Edge.  
Corner.*

3. Find a block which is an exact cubic two-inches.

4. How many cubic inch blocks are equal to this larger block?

5. Build a cube of eight small cubes. How many cubes are seen on each side?

CLASS WORK.

1. How many gallons in 16 quarts?
2.  $\frac{1}{4}$  of 16 qt. = gal.
3. How many quarts in 16 pints?
4.  $\frac{1}{4}$  of 16 pt. = qt.
5. What costs one gallon of milk at 4 cents a quart?
6. How many gallons in 16 pints?
7. If 1 gallon of milk costs 16 cents, what does 1 quart cost? What does 1 pint cost?
8. Jacob bought 4 gallons of buttermilk. He sold 3 qt. to A, 5 qt. to B, 4 qt. to C. How much had he left?
9. He sold that which he had left for 3 cents a quart. How much did he get for it?
10. Which is more, 16 pints or 7 quarts? How much?
11. Three gallons of milk = how many quarts?
12. Sold 2 quarts of milk at 4 cents a pint. How much did I get for it all?

*Perform actual operations in measuring liquids to illustrate these examples.*

SEAT WORK.

1. Copy, and fill the blanks:

$$\frac{1}{4} \text{ of } 16 =$$

$$\frac{1}{4} \text{ of } \frac{1}{4} \text{ of } 16 =$$

$$\frac{1}{2} \text{ of } 16 =$$

$$\frac{1}{4} \text{ of } \frac{1}{2} \text{ of } 16 =$$

$$\frac{1}{2} \text{ of } \frac{1}{4} \text{ of } 16 =$$

$$2 \times = 16.$$

$$4 \times = 16.$$

$$10 + = 16.$$

$$16 = 12 +$$

$$3 + 5 + 4 =$$

$$16 - 3 - 5 - 4 =$$

$$2. \quad 16 \text{ qt.} = \text{gal.}$$

$$16 \text{ pt.} = \text{qt.}$$

$$16 \text{ pt.} - 7 \text{ qt.} = \text{pt.}$$

$$16 \text{ pt.} - 7 \text{ qt.} = \text{qt.}$$

$$16 = 9 +$$

$$16 = 5 +$$

$$16 = 3 +$$

$$16 = 7 +$$

$$16 = 11 +$$

3. Copy:

$$2^2 = 4.$$

$$3^2 = 9.$$

$$4^2 = 16.$$

$$2 \times 2 = 4.$$

$$3 \times 3 = 9.$$

$$4 \times 4 = 16.$$

$$2 \times 2 \times 2 = 8.$$

## CLASS WORK.

1. How many bushels in 16 pecks? How many half-bushels?

2. How many pecks in 16 quarts? How many half-bushels?

3. At \$2 a peck, what will 6 pecks of clover-seed cost?

4. At the same price, what will 2 bushels of clover-seed cost?

5. If 3 bushels of lemons cost \$12, what does 1 bushel cost?

6. What does 1 peck cost? What does a half-bushel cost?

7. If 8 bushels of apples cost \$16, what does 1 bushel cost? One half-bushel? One peck?

8. If 8 pecks of oranges cost \$8, how much is that a peck? How much a bushel? How much a half-bushel?

9. If  $\frac{1}{2}$  peck of pears costs  $\frac{1}{2}$  dollar, how much is that a peck? How much a bushel?

10. If 4 quarts of currants cost \$1, how much is that a peck? How much a bushel?

*Let the children also buy, measure, and sell.*

## SEAT WORK.

1. Write three questions like those in the other column.

2. Copy, and fill the blanks:

$$8 \text{ qt.} = \text{pk.}$$

$$16 \text{ qt.} = \text{pk.}$$

$$6 \times \$2 = \$$$

$$2 \times 4 =$$

$$8 \times \$2 =$$

$$\frac{1}{2} \text{ of } \$12 = \$$$

$$\frac{1}{2} \text{ of } \$4 =$$

$$2 \times \frac{1}{2} \text{ of } \$4 = \$$$

$$8) \$16$$

$$\frac{1}{2} \text{ of } \$2 = \$$$

$$\frac{1}{2} \text{ of } \frac{1}{2} \text{ of } \$2 = \$$$

3. Remember this:

$$2 \times 1 = 2.$$

$$2 \times 2 = 4.$$

$$2 \times 3 = 6.$$

$$2 \times 4 = 8.$$

$$2 \times 5 = 10.$$

$$2 \times 6 = 12.$$

$$2 \times 7 = 14.$$

$$2 \times 8 = 16.$$

$$3 \times 1 = 3.$$

$$3 \times 2 = 6.$$

$$3 \times 3 = 9.$$

$$3 \times 4 = 12.$$

$$3 \times 5 = 15.$$

## CLASS WORK.

*There should be on the teacher's desk a pair of scales large enough to weigh 5 lbs. There should be the ordinary  $\frac{1}{4}$ -oz.,  $\frac{1}{2}$ -oz., 1-oz., 2-oz., 5-oz., 8-oz., 1-lb., 2-lb., 5-lb. weights.*

To-day we learn something new. We learn how to weigh objects.

Here is a weight which we call an Ounce.

Anything that is exactly as heavy as this little weight is said to *weigh* an ounce.

We will weigh some blocks.

This weight (2 oz.) is twice as heavy as the other; or, it weighs as much as two of the smaller weights.

2 ounces + 1 ounce = 3 ounces.

The sign oz. means ounce.

2 oz. + 1 oz. + 1 oz. = 4 oz.

*Weigh a number of small articles suggested by pupils.*

1. Two  $\frac{1}{4}$  oz. +  $\frac{1}{4}$  oz. = what?

2. What smaller weights combined equal the 5-oz. weight?

3. How many  $\frac{1}{2}$ -oz. weights = 5 oz.? How many =  $1\frac{1}{2}$  oz.?  
*How many =  $2\frac{1}{2}$  oz.?*

## SEAT WORK.

1. Copy the following:

*Ounce = Oz.*

*ounce = oz.*

*ounces = oz.*

*Weigh. Weight.*  
*Scales. Scales.*

2. Memorize this:

$$2 \times 8 = 16.$$

$$2 \times 7 = 14.$$

$$2 \times 6 = 12.$$

$$2 \times 5 = 10.$$

$$2 \times 4 = 8.$$

$$2 \times 2 = 4.$$

$$2 \times 1 = 2.$$

$$3 \times 5 = 15.$$

$$3 \times 4 = 12.$$

$$3 \times 3 = 9.$$

$$3 \times 2 = 6.$$

$$3 \times 1 = 3.$$

$$4 \times 4 = 16.$$

$$4 \times 2 = 8.$$

$$4 \times 1 = 4.$$

$$5 \times 3 = 15.$$

$$5 \times 2 = 10.$$

$$5 \times 1 = 5.$$

## CLASS WORK.

We will learn some more about weighing.

$$(a) \ 2 \text{ oz.} + 1 \text{ oz.} + 1 \text{ oz.} = \text{ oz.}$$

(Suit action to words.)

$$2 \text{ oz.} + 1 \text{ oz.} + 1 \text{ oz.} + 4 \text{ oz.} = \text{ oz.}$$

(b) Here is a weight as heavy as the other four. We call it, sometimes, an 8-oz. weight.

(c) Now we put all in the same scale :

$$8 \text{ oz.} + 4 \text{ oz.} + 2 \text{ oz.} + 1 \text{ oz.} + 1 \text{ oz.} =$$

how many ounces in all ?

(d) Here is a larger weight which is just as heavy as the 16 ounces. We call it a Pound. If I put the 16 ounces in one scale and the one pound in the other, they will exactly balance.

(e) How many oz. = 1 pound ?

(f) Write what you have learned.

*Several lessons can be very profitably spent in weighing different materials, such as corn, beans, wheat, oats, sand. Let the children weigh a half-pint of water in measure ; a pint of water in measure ; a pint of corn ; a pint of sand, etc.*

## SEAT WORK.

1. Write this :

*Sixteen Ounces = One Pound.*

*16 ounces = 1 pound.*

2. Write this :

oz. stands for ounce.

oz. stands for ounces.

lb. stands for pound.

lbs. stands for pounds.

3. Copy, and fill the blanks :

$$1 \text{ lb.} = \text{ oz.}$$

$$\frac{1}{2} \text{ lb.} = \text{ oz.}$$

$$\frac{1}{4} \text{ lb.} = \text{ oz.}$$

4. Copy, and fill the blanks :

$$\text{ oz.} = 1 \text{ lb.}$$

$$8 \text{ oz.} = \text{ lb.}$$

$$4 \text{ oz.} = \text{ lb.}$$

$$2 \text{ oz.} = \text{ lb.}$$

$$\text{ oz.} = \frac{1}{4} \text{ lb.}$$

$$\text{ oz.} = \frac{1}{2} \text{ lb.}$$

$$\text{ oz.} = \frac{1}{4} \text{ lb.}$$

$$4 \times 4 \text{ oz.} = \text{ oz.}$$

$$4 \times 4 \text{ oz.} = \text{ lb.}$$

$$4 \times \frac{1}{4} \text{ lb.} = \text{ oz.}$$

$$5 \text{ oz.} + 3 \text{ oz.} = \text{ oz.}$$

$$5 \text{ oz.} + 3 \text{ oz.} = \text{ lb.}$$

$$12 \text{ oz.} - 4 \text{ oz.} = \text{ lb.}$$

$$1 \text{ lb.} - 8 \text{ oz.} = \text{ oz.}$$

$$1 \text{ lb.} - 8 \text{ oz.} = \text{ oz.}$$

Give the pupils abundant practice in measuring and weighing, in buying, selling, and making change, and in the application of all the knowledge acquired in previous lessons. They should have such practice — if only for a few minutes — every day. Continue the exercise of rapid addition at sight. Children should now be able to give immediately, at sight, the sum (not exceeding 16) of any three given numbers. Use the blackboard chart already explained (page 88).

Give such combinations as follows, requiring the sum to be named instantly :

3	1	7	4	6	3	7	6	4
6	3	2	1	9	2	1	2	5
6	5	7	5	1	5	8	3	4
3	4	6	7	6	5	4	3	2
8	3	6	2	3	5	5	7	1
5	8	2	3	6	5	5	6	4
9	7	3	6	1	3	2	7	5
2	1	3	1	2	8	2	1	1
4	2	5	6	10	2	4	7	5

#### CLASS WORK.

##### Review.

Review all the principles taught or involved in the preceding lessons.

Illustrate with especial care every point not thoroughly understood by each pupil in the class.

Ask many questions, and give a great variety of practical work.

Let the pupils ask each other questions.

#### SEAT WORK.

##### Review.

Copy, and fill the blanks :

$$16 = 2 \times$$

$$16 = 4 \times$$

$$16 = 8 \times$$

$$16 \text{ in.} = 1 \text{ ft.} + \text{ in.}$$

$$16 \text{ ft.} = \text{ yd.} + \text{ ft.}$$

$$16 \text{ pt.} = \text{ qt.}$$

$$16 \text{ qt.} = \text{ gal.}$$

$$16 \text{ pk.} = \text{ bu.}$$

$$16 \text{ cts.} = \text{ dime} + \text{ cts.}$$

## THE NUMBER SEVENTEEN.

## CLASS WORK.

1. Count seventeen.
2. Take 17 steps forward ; backward.
3. Is 17 an odd number ? Why ?
4. Is 17 a composite or a prime number ? Why ?
5. Write all the prime numbers to 17.
6. Seventeen is how many more than 10 ? than 7 ? 5 ? 3 ? 15 ? 6 ? 11 ? 13 ? 9 ?
7. How many separate squares can you make with 17 sticks ?
8. How many separate triangles ?
9. Will 4 divide 17 evenly ? Will 3 ? Will any number ?
10. Seventeen is how many more than one dozen ?
11. Seventeen feet are how many yards ?
12. Seventeen inches are how much more than a foot ?
13. Seventeen ounces are how much more than a pound ?
14. Write, in Roman characters, all the numbers from 1 to 17.

## SEAT WORK.

1. Write in three ways all the numbers from one to seventeen. Draw a line under all the prime numbers. Make a star \* over all the even numbers.

2. Copy, and fill the blanks :

$$10 + \quad = 17.$$

$$10 + 5 =$$

$$17 - 15 =$$

$$17 - 7 =$$

$$\frac{1}{4} \text{ of } 16 =$$

$$\frac{1}{4} \text{ of } 17 =$$

$$\frac{1}{3} \text{ of } 15 =$$

$$\frac{1}{3} \text{ of } 17 =$$

$$17 - 12 =$$

3. Copy, and fill the blanks :

$$17 = 3 +$$

$$17 = 5 +$$

$$17 = 7 +$$

$$17 = 9 +$$

$$17 = 11 +$$

$$17 = 13 +$$

$$17 - 8 =$$

$$17 - 6 =$$

$$17 - 12 =$$

$$2 \overline{)17} \quad 3 \overline{)17} \quad 4 \overline{)17} \quad 5 \overline{)17}$$

## CLASS WORK.

1. Measure 17 inches.
2. How much more than a foot is 17 inches?
3. Measure 17 feet.
4. Measure 16 feet and 6 inches.
5. 16 ft. + 6 in. = how many feet?

*Let every pupil measure for himself a cord just 16½ feet long.*

6. We call 16½ feet **one rod**. Remember this:

$$16\frac{1}{2} \text{ feet} = 1 \text{ rd.}$$

7. How many yards in 15 feet?

8. 16½ feet is how much more than 15 feet? than 5 yd.?

9. 1½ feet is what part of a yard?

10. How many yards in 16½ feet?

11. How many yards in 1 rod?

12. Cut with great care a cord just 1 rod long. We will keep this for future measurements.

13. Measure the length of the schoolroom in rods, feet, and inches.

## SEAT WORK.

1. Write this:

*Sixteen and one-half feet = One rod.  
Five and one-half yards = One rod.*

$$16\frac{1}{2} \text{ ft.} = 1 \text{ rd.}$$

$$5\frac{1}{2} \text{ yd.} = 1 \text{ rd.}$$

2. Copy, and fill the blanks:

$$12 \text{ in.} = \text{ ft.}$$

$$3 \text{ ft.} = \text{ yd.}$$

$$5\frac{1}{2} \text{ yd.} = \text{ rd.}$$

$$\text{in.} = 1 \text{ ft.}$$

$$\text{ft.} = 1 \text{ yd.}$$

$$\text{ft.} = 1 \text{ rd.}$$

$$\text{yd.} = 1 \text{ rd.}$$

$$17 \text{ in.} = 1 \text{ ft.} + \text{ in.}$$

$$17 \text{ ft.} = 5 \text{ yd.} + \text{ ft.}$$

$$17 \text{ oz.} = 1 \text{ lb.} + \text{ oz.}$$

$$17 \text{ qt.} = 4 \text{ gal.} + \text{ qt.}$$

$$17 \text{ pt.} = 8 \text{ qt.} + \text{ pt.}$$

$$17 \text{ pt.} = 2 \text{ gal.} + \text{ pt.}$$

$$17 \text{ pk.} = 4 \text{ bu.} + \text{ pk.}$$

$$17 \text{ ft.} = 1 \text{ rd.} + \text{ in.}$$

$$17 \text{ da.} = 2 \text{ wk.} + \text{ da.}$$

$$17 \text{ wk.} = 4 \text{ mo.} + \text{ wk.}$$



### CLASS WORK.

1. Measure 1 rod on the floor or the ground.

2. How many steps do you take in going a rod?

3. Measure on the playground one square rod, and drive a short stake down at each corner.

4. Measure a distance equal to ten rods on the playground or in the street.

5. Count the steps you take in walking that distance.

*Before this time the pupils will have naturally learned to count several hundred.*

6. How many feet in half a rod?

7. What is the area of a flower-bed 2 ft. wide and 8 ft. long?

8. What is the area of a board one foot wide and 14 ft. long?

9. Find the area of one side of your book; of your slate; of your desk.

10. Draw a right triangle, the base being 4 feet and the altitude 4 feet. What is its area?

## SEAT WORK.

1. Copy, and fill the blanks :

$$1 \text{ yd.} + 2 \text{ ft.} = \text{ft.}$$

$$5 \text{ yd.} + 1\frac{1}{2} \text{ ft.} = \text{ft.}$$

$$5 \text{ yd.} + 1 \text{ ft.} + 6 \text{ in.} = \text{rd.}$$

*NOTE.* In such expressions as the above, the sign + is commonly omitted.

1 rd. = 16 ft. in.

$$2 \text{ yd. } 2 \text{ ft.} = \quad \text{ft.}$$

$$1 \text{ ft. in.} = 17 \text{ in.}$$

$$5 \text{ yd. } 2 \text{ ft.} = \quad \text{ft.}$$

$$\frac{1}{2} \text{ yd.} = \text{ft.}$$

$$1\frac{1}{2} \text{ yd.} = \text{ft.}$$

$$2\frac{1}{2} \text{ yd.} = \text{ft.}$$

$$3\frac{1}{2} \text{ yd.} = \quad \text{ft.}$$

$$4\frac{1}{2} \text{ yd.} = \quad \text{ft.}$$

$$5\frac{1}{2} \text{ yd.} = \quad \text{ft.}$$

1 yd. 2 ft. =      ft.

**16½ ft. =      yd. =      rd.**

- 2. Add :**

3	4	5	7	6	5
5	4	3	4	3	4
7	3	5	3	4	5
2	6	3	2	3	3

5      4      3      4      3      4

7 3 5 3 4 5

$$\begin{array}{cccccc} 2 & 6 & 3 & 2 & 3 & 3 \\ & & & \hline & & & & \hline & & & & \hline \end{array}$$

- 3. Multiply :**

5	4	7	8	6	4
3	4	2	2	2	3

3 4 2 2 2 3

## THE NUMBER EIGHTEEN.

## CLASS WORK.

1. Count eighteen.
2. Is 18 an odd number?
3. Name all the odd numbers below 18.
4. Is 18 a composite number?
5. What two numbers multiplied together make 18?
6. What prime numbers multiplied together make 18?
7. Name all the numbers that will divide 18 evenly.

We call such numbers **Divisors**.

8. Eighteen is how much more than a dozen?

9. Six is what part of a dozen?

10.  $1\frac{1}{2}$  doz. = how many?

11. How many half-dozens in 18?

12. Eighteen inches is how much more than a foot?

13. Eighteen feet is how much more than a rod?

*Ask many questions similar to the above, and illustrate each one.*

14. How many working days in 3 weeks? How many school days?

## SEAT WORK.

1. With 18 sticks make as many squares as you can.

2. With 18 sticks make as many triangles as you can.

3.  $\frac{1}{3}$  of 18 =

$\frac{1}{2}$  of 18 =

$\frac{1}{4}$  of 18 =

$\frac{1}{6}$  of 18 =

4.  $\frac{1}{2}$  of 18 -  $\frac{1}{3}$  of 18 =

$18 - 6 =$

$10 + = 18.$

$16\frac{1}{2} + \frac{1}{2} =$

$16\frac{1}{2} + 1 =$

$16\frac{1}{2} + = 18.$

5.  $18 = 12 +$

$18 = 5 +$

$18 = 11 +$

$18 = 7 +$

$18 = 13 +$

$18 = 3 +$

$18 = 15 +$

$18 = 9 +$

$18 = 6 +$

$18 = 14 +$

$2 \overline{)18}$      $3 \overline{)18}$      $4 \overline{)18}$      $5 \overline{)18}$

$6 \overline{)18}$      $9 \overline{)18}$      $7 \overline{)18}$      $10 \overline{)18}$

## CLASS WORK.

1. How many feet in 18 inches?

2. How many feet in one-half yard?

3. How many inches in one-half yard?

4. How many yards in 15 ft. ? in 18 ft. ?

5. Eighteen feet is how much more than 1 rod?

6. Measure on the black-board one square yard.

7. Divide this square yard into 4 equal squares.

8. What is the size of each square?

9. Find the area of a board 18 ft. long and 1 ft. wide.

10. Of a flower-bed 8 ft. long and 2 ft. wide.

11. Of a flower-bed 6 ft. long and 3 ft. wide.

12. Of a board 6 ft. long and  $1\frac{1}{2}$  ft. wide.

13. What cost 3 yards of calico at 6 cents a yard?

14. If ribbon costs 2 cents a yard, how many yards can I buy for 18 cents?

*Let the children buy and sell.*

## SEAT WORK.

1. Copy, and fill all blanks:

$$12 \overline{) 18}$$

$$\frac{1}{2} \text{ of } 3 \text{ ft.} = \text{ ft.}$$

$$\frac{1}{2} \text{ of } 1 \text{ yd.} = \text{ ft.}$$

$$1\frac{1}{2} \text{ ft.} = \text{ in.}$$

$$\frac{1}{2} \text{ yd.} = \text{ in.}$$

$$3 \overline{) 15}$$

$$3 \overline{) 18}$$

$$16\frac{1}{2} + = 17.$$

$$16\frac{1}{2} \text{ ft.} + \text{ ft.} = 18 \text{ ft.}$$

$$8 \times 2 =$$

$$6 \times 3 =$$

$$6 \times 1\frac{1}{2} =$$

$$12 \text{ in.} = \text{ ft.}$$

$$6 \text{ in.} = \text{ ft.}$$

$$18 \text{ in.} = \text{ ft.}$$

$$3 \text{ in.} = \text{ ft.}$$

$$9 \text{ in.} = \text{ ft.}$$

$$4 \text{ in.} = \text{ ft.}$$

2. Draw an oblong which is 16 inches around.

3. Draw a square which is the same distance around.

4. Find the area of the oblong. Find the area of the square.

5. What is the distance around a rectangle 7 in.  $\times$  1 in. ? What is the area of such a rectangle?

## CLASS WORK.

1. How much more than 1 lb. is 18 oz. ?

2. If 1 lb. of sugar costs 18 cents, what will  $\frac{1}{2}$  lb. cost ?

3. If 1 lb. of starch costs 12 cents, what will 4 oz. cost ?

4. What will  $1\frac{1}{2}$  lbs. cost, at same rate ?

5. What is the weight of 1 qt. of wheat ?

6. Which is heavier, a quart of wheat or a quart of corn ?

7. If one quart of rice should weigh 2 lbs., what would 1 pk. weigh ?

8. What is the weight of 1 pint of sand ?

9. What is the postage on 9 letters ?

*NOTE. A single letter should not weigh more than 1 oz. If heavier, an extra charge is made for postage.*

10. What is the postage on a book weighing 1 lb. ?

11. What is the postage on 5 circulars each weighing 3 oz. ?

*Explain the laws regarding postage on first-class and third-class mail matter.*

## SEAT WORK.

1. Copy, and fill the blanks :

$$6 \times 3 =$$

$$2 \times = 18.$$

$$\frac{1}{2} \text{ of } 16 = 2 \times$$

$$\frac{1}{2} \text{ of } 18 = 3 \times$$

$$18 \text{ oz.} - 1 \text{ lb.} = \text{ oz.}$$

$$4 \text{ oz.} = \text{ lb.}$$

$$1 \times 12 =$$

$$\frac{1}{2} \text{ of } 12 =$$

$$1\frac{1}{2} \text{ of } 12 =$$

2. Remember this :

$$2 \times 1 = 2. \quad 3 \times 1 = 3.$$

$$2 \times 2 = 4. \quad 3 \times 2 = 6.$$

$$2 \times 3 = 6. \quad 3 \times 3 = 9.$$

$$2 \times 4 = 8. \quad 3 \times 4 = 12.$$

$$2 \times 5 = 10. \quad 3 \times 5 = 15.$$

$$2 \times 6 = 12. \quad 3 \times 6 = 18.$$

$$2 \times 7 = 14. \quad 4 \times 1 = 4.$$

$$2 \times 8 = 16. \quad 4 \times 2 = 8.$$

$$2 \times 9 = 18. \quad 4 \times 3 = 12.$$

$$4 \times 4 = 16.$$

3. Draw rectangles :

$$4 \text{ in.} \times 4 \text{ in.}$$

$$5 \text{ in.} \times 3 \text{ in.}$$

$$6 \text{ in.} \times 2 \text{ in.}$$

$$7 \text{ in.} \times 1 \text{ in.}$$

Find the distance around each.

Find the area of each.

## CLASS WORK.

1. How many quarts in 18 pints? How many gallons?
2. At 3 cents a pint what would 3 quarts of milk cost?
3. If a gallon of vinegar cost 16 cents, what costs 1 pint? What costs 9 pints?
4. Nine pints is how much more than a gallon?
5. How many bushels in 18 pecks?
6. If 18 pk. of clover-seed cost \$18, what does 1 pk. cost? What does 1 bu. cost?
7. What three pieces of money together make 18 cents?
8. How many 3-cent pieces together make 18 cts.?
9. How many letters can you post with 18 one-cent stamps?
10. Ella is 10 years old, and Jessie is 5 years older than Ella. How old is Jessie?
11. A man earned 15 dollars by working 5 days. How much per day did he earn?
12. A boy can do a piece of work in 15 days. In how many days can 3 boys do the same work?

## SEAT WORK.

1. Write five questions like those in the other column.
2. Draw a rectangle 9 inches long and 2 inches wide. Divide it into square inches.
3. Draw a rectangle 6 inches long and 3 inches wide. Divide it into square inches.
4. Draw a square 2-inches.
5. Divide it into 2 equal triangles.
6. Copy, and fill the blanks :
  - $\frac{1}{2}$  of 18 =
  - $\frac{1}{3}$  of 18 =
  - $\frac{1}{4}$  of 18 =
  - $\frac{2}{3}$  of 18 =
  - $\frac{3}{4}$  of 18 =
  - $\frac{5}{6}$  of 18 =
  - $\frac{7}{8}$  of 18 =
  - $\frac{1}{2}$  of 18 +  $\frac{1}{3}$  of 18 =
  - $\frac{1}{3}$  of 18 +  $\frac{1}{4}$  of 18 =
  - $\frac{1}{4}$  of 18 +  $\frac{1}{2}$  of 18 =
  - $\frac{1}{2}$  of 18 +  $\frac{2}{3}$  of 18 =
  - 18 pt. = qt.
  - pt. = 1 gal.
  - $\frac{1}{2}$  of 16 =
  - $\frac{1}{3}$  of 18 =
  - $\frac{1}{2}$  of 16 +  $\frac{1}{3}$  of 18 =
  - $\frac{2}{3}$  of 18 =

## THE NUMBER NINETEEN.

## CLASS WORK.

1. Is 19 an odd number?
2. Is 19 a composite number?
3. Nineteen is how much more than 10? than 12? 16? 7?
4. Nineteen is the sum of what two numbers?
5. Nineteen is the sum of what three numbers? of what four numbers?
6. How much more than 2 weeks is 19 days?
7. How many pounds in 19 ounces?
8.  $\frac{1}{2}$  of 19 = what?
9.  $\frac{1}{3}$  of 18 = what?  
 $\frac{1}{3}$  of 1 = what?  
 $\frac{1}{3}$  of 19 = what?
10. What four pieces of money, all different, equal 19 cents?
11. What five bills equal 19 dollars?
12. Nineteen feet equal how much more than a rod?
13. Nineteen is how many more than a dozen?
14. Nineteen =  $9 + 10$ . Is 9 a composite number? is 10?

## SEAT WORK.

1. Write all the odd numbers to 19.
2. Write all the prime numbers to 19.

3. Add these columns :

2	2	7	5	1
3	6	3	4	6
5	2	2	3	2
4	4	1	2	5
3	4	5	1	3
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

4. Multiply :

5	2	6	3	9
3	7	2	6	2
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

5. Take the lower number from the upper :

18	9	13	17	16
12	5	6	4	9
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

6. Make 19 lines, each one inch long.
7. Make as many triangles as you can, using only 19 lines.
8. Make as many squares as you can, in the same way.
9.  $19 = 1 \text{ doz.} +$   
 $19 \text{ oz.} = 1 \text{ lb.} + \text{ oz.}$   
 $19 \text{ ft.} = 6 \text{ yd.} + \text{ ft.}$   
 $19 \text{ da.} = 2 \text{ wk.} + \text{ da.}$

## CLASS WORK.

1. Measure a line 19 feet long.

2. How much longer is this line than 1 rod?

3. Measure a line 18 feet long. How many yards in this line?

4. Measure a line 19 inches long.

5. How much more than a foot long is this line?

6. How much more than half a yard long is this line?

7. Measure 19 rods in the playground or street.

8. Measure the height of the ceiling in this room.

9. Measure the length and width of the room. Write the result in feet and inches.

10. Measure the size of the door; of the windows.

*Make up other questions similar to the above. In every case let the actual measurements be made.*

*Have the pupils write the result each time. Several recitations may be occupied with this work.*

## SEAT WORK.

1. What three numbers added together make 19?

2. Write the names of 19 things which you have learned to measure or to weigh.

3. Add at sight:

7	3	8	7	3	8	5
6	5	9	9	6	11	13

3	5	6	12	3	17
12	13	12	4	16	2

6	9	12	15	7	10
3	3	3	3	3	3

3	6	5	4	6	3
5	3	4	5	3	6
4	6	5	4	6	3
7	3	5	4	2	6

4	3	4	1	5
4	5	6	2	6
5	5	3	3	7
5	3	5	4	1

5	4	6	7	5	7
3	4	2	2	2	2
2	4	1	3	1	1
1	4	5	3	3	7

4. Write all the numbers from one to nineteen.

## CLASS WORK.

**Review.**

*Review all the principles learned in this Step.*

*Let the pupils practise daily selling, buying, and making change.*

*Give daily drills in rapid addition, the sum not to exceed 19.*

*Let the pupils do much practical work in measuring and weighing.*

*Require the pupils to write all operations distinctly and clearly.*

*Require accuracy as regards results. Review every difficult point.*

## SEAT WORK.

**Review.**

Copy, and fill the blanks :

18 in. = ft.

18 in. = yd.

18 ft. = yd.

18 oz. = lb. oz.

18 pt. = qt.

18 pt. = gal. qt.

18 qt. = gal. qt.

18 pk. = bu.

18 ct. = dimes ct.

18 dimes = \$ + dimes.

18 da. = wk. da.

18 wk. = mo. wk.

18 mo. = yr.

## THINGS LEARNED IN THIS STEP.

1. *The numbers 11 to 19, inclusive, — all combinations.*
2. *How to write numbers of two figures.*
3. *Rapid and accurate addition to sums not exceeding 19.*
4. *Multiplication "table" to  $2 \times 9$ ,  $3 \times 6$ ,  $4 \times 4$ ,  $5 \times 3$ ,  $6 \times 3$ ,  $7 \times 2$ ,  $8 \times 2$ ,  $9 \times 2$ .*
5. *Twelve things = one dozen.*
6. *Twelve months = one year.*
7. *Twelve inches = one foot.*
8. *Linear measure to 19 in., 19 ft., 19 yd., or 19 rd.*
9. *Liquid measure to 19 pt., etc.*
10. *Dry measure to 19 qt., etc.*
11. *Divisors of a number.*



12. *Factors of a number.*
  13. *Area of squares and oblongs, and how to find it.*
  14. *Odd numbers and even numbers.*
  15. *Composite numbers and prime numbers.*
  16. *Postage on letters.*
  17. *Buying, selling, and making change to 19 cts., \$19, etc.*
  18. *The sign \$.*
  19. *How to find the area of a board.*
  20. *Sixteen ounces = one pound.*
  21. *Cubes and cubical bodies. Faces, edges, corners.*
  22. *The squares of 2, 3, 4.*
  23. *Sixteen and one-half feet = one rod.*
  24. *The relative weights of different substances.*
  25. *The measurement of surfaces of land, as one square rod, etc.*
- 

## THINGS TO BE TAUGHT BEFORE LEAVING THIS STEP.

1. *Teach the use of the sign  $\div$ .*
2. *Teach the pupils to count to any given number.*
3. *To read numbers to 1000.*
4. *To measure lengths, breadths, and thicknesses within the limits of these lessons.*
5. *To write numbers with great accuracy and neatness.*
6. *To find areas of surfaces within given limits.*
7. *To draw squares, oblongs, and triangles of given dimensions.*
8. *To divide any given (short) line into a given number of parts.*
9. *To ascertain by experiment the comparative weight of different substances.*
10. *To understand the meaning of the word "factor"; and to name the factors and the prime factors of any given number below 20.*

## SEAT WORK.

Copy, fill the blanks, and write answers where they are required :

Twelve things of any kind = one

One dozen pints =        quarts =        gallons.

Twelve inches =        foot.

Twelve inches = what part of a yard ?

Eighteen inches =        feet.

Eighteen inches = what part of a yard ?

One-half of a yard is how much more than one-third of a yard ?

The divisors of 18 are

The factors of 18 are

The prime factors of 18 are

Seven odd numbers are

Ten even numbers are

Eight composite numbers are

The sign \$ means        . The sign for cents is

A cubical body has        faces,        edges, and        corners.

In one rod there are        feet, or        yards.

The square of 2 =        ; of 3 =        ; of 4 =       

If a letter weighs but one ounce, the postage is        cts.

A square is

A triangle is

An oblong is

In a pound there are        ounces.

In a half-pound there are        ounces.

Twelve ounces = what part of a pound ?

*How many pounds in 20 ounces ?*

# THE INDUSTRIAL ARITHMETIC.



*STEP THE FOURTH.*

TWENTY TO ONE HUNDRED.



## STEP THE FOURTH.



### THINGS ALREADY LEARNED.

See Step the Second, page 57.

See Step the Second, page 106, 107, 108.

See Step the Third, page 112, and page 161.

Please turn to the pages referred to above, and read carefully. If your pupils have not learned everything there enumerated, see that they do learn it before beginning the work properly belonging to this Step.

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### CAUTIONS.

Turn to page iv, and read again the Directions to Teachers. In the teaching of the Fourth Step there is an endless number of opportunities for illustration and for practical work. Make use of these opportunities.

*Let every lesson be a voyage of discovery.*

In the processes of addition and multiplication, it will not, at this stage, be necessary to explain *why* "we carry 1 for every 10"; nor will it be necessary to dwell on the reasons for "borrowing" in subtraction. Shun, if possible, the expressions "to carry" and "to borrow."

Teach, as yet, the HOW; the WHY will be considered later.

Adopt no established form of analysis; but let all explanations be brief, well understood, and accurate.

Do not permit pupils to learn *formulas*, simply as such. Every new principle should come into the child's mind as a growth, and, whenever possible, should be discovered by the child himself.

Continue the thorough memorizing of "tables," and the daily practice of rapid addition.

Continue the practical work of measuring and weighing; also of buying, selling, and making change.

The examples given in each of the following sections are suggestive of scores of others of a similar character which the teacher is expected to prepare.

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#### THINGS NEEDED.

See Step the First, page 3; also, Step the Third, page 111.

In addition to the articles elsewhere mentioned, there will be needed before the completion of this step:

A barrel, empty.

Large pieces of pasteboard of different shapes.

A stout cord one *chain* in length.

A carpenter's square.

A clock-face with movable hands.

## REVIEW OF STEPS FIRST, SECOND, AND THIRD.

*Test the pupils' knowledge :*

1. *Of the comparative value of numbers from 1 to 19.*
2. *Of the operations of adding, multiplying, subtracting, dividing.*
3. *Of parts of numbers from  $\frac{1}{2}$  to  $\frac{1}{10}$ .*
4. *Of measurements of length and of capacity.*
5. *Of the divisions of time.*
6. *Of square measure.*
7. *Of cubical bodies.*
8. *Of odd numbers and even numbers.*
9. *Of composite numbers and prime numbers.*
10. *Of weights and weighing.*
11. *Of the smaller pieces of money.*

*Test the pupils' ability :*

1. *To add, at sight, any two or three numbers whose sum is less than 20.*
2. *To multiply, at sight, any two numbers the product of which is less than 20.*
3. *To name, immediately, the difference between any two numbers less than 20.*
4. *To divide any number less than 20 into any given number of parts.*
5. *To measure the length, breadth, or thickness of given objects.*
6. *To estimate, by the eye, the length, breadth, etc., of given objects.*
7. *To perform limited operations in dry measure and liquid measure.*
8. *To distinguish odd numbers and even numbers, prime numbers and composite numbers.*
9. *To separate composite numbers into their component factors.*
10. *To weigh small objects.*
11. *To distinguish pieces of money at sight.*
12. *To buy, sell, and make change quickly and accurately.*

## THE NUMBER TWENTY.

## CLASS WORK.

1. Count ten sticks, placing them together thus:



2. Count ten other sticks, placing them in a similar group.

3. How many sticks have you in the two groups?

4. Twenty = how many tens?

5. Write the number twenty in figures:

20

6. What does the figure 2 show? What does the cipher, 0, show?

7. Write the numbers 30, 40, 50, 60, 70, 80, 90. Explain the meaning of each figure.

8. What numbers multiplied together = 20? What prime numbers multiplied together = 20?

9. What, then, are the prime factors of 20?

10. How many dimes in 20 cents? Two dimes = what part of a dollar?

*Treat the numbers 30, 40, 50, 60, 70, 80, 90 in a similar way.*

## SEAT WORK.

1. Copy, and commit to memory:

$$2 \times 10 = 20.$$

$$2 \times 11 = 22.$$

$$2 \times 12 = 24.$$

$$3 \times 7 = 21.$$

$$3 \times 8 = 24.$$

$$3 \times 9 = 27.$$

$$3 \times 10 = 30.$$

$$3 \times 11 = 33.$$

$$3 \times 12 = 36.$$

$$4 \times 5 = 20.$$

$$4 \times 6 = 24.$$

$$4 \times 7 = 28.$$

2. Copy, and fill the blanks:

$$20 \text{ in.} = \text{ft. in.}$$

$$20 \text{ ft.} = \text{yd. ft.}$$

$$20 \text{ ft.} = \text{rd. ft.}$$

$$20 \text{ pt.} = \text{qt.}$$

$$20 \text{ qt.} = \text{gal.}$$

$$20 \text{ qt.} = \text{pk.}$$

$$20 \text{ pk.} = \text{bu.}$$

$$20 \text{ oz.} = \text{lb. oz.}$$

$$20 \text{ oz.} = \text{lb.}$$

$$20 \text{ da.} = \text{wk.}$$

$$20 \text{ wk.} = \text{mo.}$$

$$20 \text{ mo.} = \text{yr. mo.}$$

$$20 \text{ cts.} = \text{dimes.}$$

$$20 \text{ dimes} = \$$$



## TWENTY TO THIRTY.

## CLASS WORK.

1. Measure 21 ft. How many yards? 21 in. = how many feet and inches?

2. What is the area of a rectangle 1 ft. 9 in. long and 1 in. wide?

3. Draw another rectangle 3 inches wide and  $\frac{1}{2}$  as long.

4. A garden-bed is 8 feet long and 4 feet wide. What is the distance around the edge?

5. Two dozen = how many?

6. How many days in three weeks? in four weeks?

7. How many months in 28 weeks?

8. How many months in 2 years?

9. How many school-days in five weeks?

10. How many school-days in one school-month?

11. How many working days in 4 weeks? How many Sundays?

12. How many pounds in 24 ounces?

13. How many gallons in 24 quarts? in 24 pints.

## SEAT WORK.

1. Copy this:

*Twenty = One score.*

2. Copy, and fill the blanks:

21 da. = wk.

21 ft. = yd.

21 wk. = mo. wk.

21 in. = ft. in.

21 dimes = \$ dimes.

3. Copy, and fill the blanks:

$\frac{1}{2}$  of 21 =

$2 \times = 22.$

8 yd. = ft.

$\frac{1}{2}$  of 28 =

$(2 \times 3) + (2 \times 4) =$

$2 \times 12 =$

$3 \times 7 =$

$4 \times 7 =$

$28 \div 4 =$

$5 \times = 25.$

4. Copy, and fill the blanks:

24 da. = wk. da.

24 working da. = wk.

24 qt. = gal.

24 pk. = bu.

24 gal. = pk.

24 oz. = lb.

24 things = dozen.

## CLASS WORK.

1. What is the area of a square four-inches? of a square five-inches?

2. What is the area of a piece of paper 7 in. long and 1 in. wide? of a piece 7 in. long and 4 in. wide?

3. What is the area of a sidewalk 1 yd. wide and 30 yd. long?

4. What is the area of a field 3 rods wide and 9 rods long?

5. What is the area in square yards of a flower-bed 27 ft. long and 6 ft. wide?

*Make actual measurements in each of the above examples.*

6. Is 20 a prime number?

7. What numbers will exactly divide 20?

8. What numbers will exactly divide 21?

9. What numbers will exactly divide 22?

10.  $\frac{1}{2}$  of 20 = ?     $\frac{1}{4}$  of 20 = ?

$\frac{1}{5}$  of 20 = ?     $\frac{1}{10}$  of 20 = ?

11.  $\frac{1}{3}$  of 21 = ?     $\frac{1}{6}$  of 21 = ?

$\frac{1}{7}$  of 21 = ?     $\frac{1}{4}$  of 24 = ?

$\frac{1}{8}$  of 24 = ?     $\frac{1}{7}$  of 28 = ?

12.  $\frac{1}{2}$  of 22 = ?     $\frac{1}{4}$  of 22 = ?

$\frac{1}{11}$  of 22 = ?     $\frac{1}{11}$  of 22 = ?

## SEAT WORK.

1. Write all the prime numbers from 1 to 29.

2. Write all the composite numbers from 4 to 30, and show what prime factors make up each, thus :

$$4 = 2 \times 2.$$

$$6 = 2 \times 3.$$

$$8 = 2 \times 2 \times 2.$$

3. Copy, and fill the blanks :

$$2 \times 2 =$$

$$3 \times 3 =$$

$$4 \times 4 =$$

$$5 \times 5 =$$

$$2 \times 2 \times 2 =$$

$$3 \times 3 \times 3 =$$

4. Copy, and fill the blanks :

$$\frac{1}{2} \text{ of } 20 =$$

$$\frac{1}{4} \text{ of } 20 =$$

$$\frac{1}{5} \text{ of } 20 =$$

$$\frac{1}{10} \text{ of } 20 =$$

$$\frac{1}{10} \text{ of } 20 =$$

$$\frac{1}{2} \text{ of } 21 =$$

$$\frac{1}{3} \text{ of } 21 =$$

$$\frac{1}{4} \text{ of } 21 =$$

$$\frac{1}{6} \text{ of } 21 =$$

$$\frac{1}{7} \text{ of } 21 =$$

$$\frac{1}{7} \text{ of } 21 =$$

$$\frac{1}{7} \text{ of } 21 =$$

## CLASS WORK.

1. Count to 30 by 3's; by 4's; by 5's; by 6's.

2. Count backwards from 30 in the same way.

3. Jessie bought  $1\frac{1}{2}$  lbs. of candy for 20 cts. a pound. What did it cost?

4. She paid for it with two pieces of money. What were they?

5. She gave 3 oz. of the candy to Bessie, and 5 oz. to Rose. How much had she left?

6. If 4 oz. of spices can be bought for 7 cents, what will 1 lb. cost?

7. If 1 lb. of coffee cost 30 cts., what will  $\frac{1}{2}$  lb. cost?

*Let the following questions be illustrated experimentally.*

8. How many ounces in  $1\frac{1}{2}$  lbs.? in  $1\frac{1}{4}$  lbs.?

9. How many ounces in 1 pint of oats?

10. How many ounces in 1 pint of corn?

11. What cost 3 lbs. of rice, at 7 cents a pound?

12. What cost 2 lbs. of beef, at  $12\frac{1}{2}$  cents a pound?

## SEAT WORK.

1. What two numbers multiplied together make 24? 26? 28? 30?

2. Write all the numbers that will divide 24 evenly.

3. What 3 numbers added together make 30?

4. What three numbers multiplied together make 20? 24? 28?

5. Write all the numbers that will divide 27 equally; all that will divide 28.

6. Write the following, and if you have not already memorized it, do so now.

$$2 \times 14 = 28.$$

$$2 \times 15 = 30.$$

$$3 \times 7 = 21.$$

$$3 \times 8 = 24.$$

$$3 \times 9 = 27.$$

$$3 \times 10 = 30.$$

$$4 \times 5 = 20.$$

$$4 \times 6 = 24.$$

$$4 \times 7 = 28.$$

$$5 \times 4 = 20.$$

$$6 \times 5 = 30.$$

$$7 \times 3 = 21.$$

$$7 \times 4 = 28.$$

## CLASS WORK.

1. Here is a small box. How many faces has it? edges? corners?

2. Measure the length and breadth of one side.

3. What is the area of one side? of both sides?

4. Measure the length and breadth of one end.

5. What is the area of one end? of both ends?

6. Measure the length and breadth of the top.

7. What is the area of the top? of the bottom? of the top and bottom together?

8. What is the entire area of the surface of the box? (Write it in good form, thus :

Area of 2 sides =

“ “ 2 ends =

“ “ top =

“ “ bottom =

Area of entire surface = )

*Measure other boxes of different sizes.*

*Show how to find the area of the two sides of a board.*

*Require accuracy in all these exercises.*

## SEAT WORK.

1. The teacher will give you a block or a small box, which you will carefully measure, writing down all the dimensions, as follows :

Length of side =

Breadth of side =

Area of one side =

“ “ both sides =

Length of end =

Breadth of end =

Area of one end =

“ “ both ends =

Length of top =

Breadth of top =

Area of top =

“ “ bottom =

“ “ top and bottom =

Area of entire surface =

2. Here is a board 1 inch thick. Find its entire area in the same way.

3. Here is a sheet of paper. Find the area of one side.

4. Here is a cubic block, every edge of which is one inch in length. How many square inches of paper will be required to cover it?

## CLASS WORK.

## Review Lesson.

1. Here is a block. Measure the length and breadth of each face.

2. Since the length of each edge is the same, what do we call it? If the length of each edge is 1 inch, what further may we call it?

3. If the length of each edge were 2 feet, what would we call it?

4. Here is a cube. Measure each edge.

5. Here is another. Measure each edge, and tell what it is called.

6. How many cubic feet are required to make a cubic 2-feet?

7.  $2 \times 2 \times 2 =$  how many?

8. How many cubic inches are required to make a cubic 3-inches? Try it.

9.  $3 \times 3 \times 3 =$  how many?

*Let the pupils, whenever possible, find and prove the truth of things by actual experiment.*

*Give a variety of practical exercises in cubic measure. But at first measure only small cubes.*

## SEAT WORK.

1. Copy, and fill the blanks:

$$24 = \text{ doz.}$$

$$24 = 3 \times$$

$$24 = 4 \times$$

$$24 = 2 \times 2 \times 2 \times$$

$$24 = \text{ tens + ones.}$$

$$24 \text{ in.} = \text{ ft.}$$

$$24 \text{ ft.} = \text{ yd.}$$

$$24 \text{ pt.} = \text{ qt.}$$

$$24 \text{ qt.} = \text{ gal.}$$

$$24 \text{ qt.} = \text{ pk.}$$

$$24 \text{ pk.} = \text{ bu.}$$

$$24 \text{ oz.} = \text{ lb.}$$

$$24 \text{ da.} = \text{ wk. da.}$$

$$24 \text{ wk.} = \text{ mo.}$$

$$24 \text{ mo.} = \text{ yr.}$$

$$24 \text{ cts.} = \text{ dimes cts.}$$

$$24 \text{ dimes} = \$ \text{ dimes.}$$

2. Draw a rectangle that shall contain 24 square inches.

3. Draw two squares which together shall contain 25 square inches.

4. Draw one square which is equal in area to the two squares just drawn.

5. Draw three squares, all different, the sum of whose areas is 21 square inches.

## CLASS WORK.

Learn this :

24 hours = one day.

1. What part of a day is 12 hours? 6 hours?

2. How many hours from noon till midnight?

3. How many hours from 9 o'clock in the morning to 3 o'clock in the afternoon?

A.M. stands for morning, or before noon.

P.M. stands for afternoon.

M. stands for noon.

4. How many hours from 1 o'clock A.M. to 11 o'clock P.M.? from 11 o'clock P.M. to 1 o'clock A.M.?

*Illustrate these exercises by reference to the schoolroom clock.*

5. If I work 4 hours a day, how many hours do I work in a week?

6. What part of a day is 8 hours? 12 hours? 16 hours?

7. If we study 6 hours each day, how many hours do we study in a school-week?

8. How many times does the hour-hand of the clock go around the dial in 24 hours?

## SEAT WORK.

1. Copy this:

*Twenty-four hours  
= one day.*

*24 hrs. = 1 da.*

*A. M. stands for  
Before Noon.*

*P. M. stands for  
After Noon.*

*M. stands for  
Noon.*

2. Copy, and fill the blanks:

1 da. = 24 hr.

$\frac{1}{2}$  da. =

$\frac{1}{4}$  da. =

8 hr. = day.

4 hr. = day.

2 hr. = day.

$\frac{1}{3}$  da. = hr.

24 da. = wk. da.

24 wk. = mo.

24 mo. = yr.

3. Draw the picture of a clock-face, and mark the hours correctly.

*Continue the daily practice of rapid addition. The addition chart may now be completed, and will appear as below :*

1	2	3	8	9	1	7	8	9	5	6	7	4
9	6	2	6	7	8	6	7	8	4	5	6	3
8	9	1	6	7	8	5	6	7	3	4	5	2
9	1	2	7	8	9	8	7	8	4	5	6	3
9	1	2	7	1	2	2	3	4	5	6	2	3
2	3	4	4	5	6	9	8	7	1	2	3	9
5	5	6	9	1	7	1	9	1	8	9	9	5
1	2	3	5	6	1	7	8	9	6	5	4	4
4	5	6	8	9	1	3	4	3	9	1	7	1
4	5	6	8	4	5	1	2	3	9	1	2	8
3	4	5	2	3	4	9	7	2	8	9	1	8
4	5	5	4	5	9	1	2	3	9	1	2	7
5	6	7	4	5	6	2	3	4	1	2	3	8

*Require the pupils to give the sum of any three numbers in a column at sight.*

*Require the pupils to give sums of two given pairs of numbers at sight.*

*Afterward, to give the sum of these sums ; or, in other words, the sum of four numbers at sight.*

## THE NUMBERS THIRTY TO FORTY.

## CLASS WORK.

1. Thirty = how many tens?
2.  $\frac{1}{2}$  of 20 = how many?  
 $1\frac{1}{2} \times 20$  = how many?
3. How many dozens = 30?
4. How many score = 30?
5. How many half-dimes in 30 cents? How many dimes?
6. How many half-dozen in 30?
7. How many yards in 30 feet?
8. How many feet in 30 inches?
9. If one dozen eggs cost 30 cents, what is the cost of one egg? of half-a-dozen eggs?
10. What two pieces of money = 30 cents? What two bills = 30 dollars?

*Make up other questions similar to the above.*

11. If 6 oranges cost 30 cents, how much does one orange cost? How much do 3 oranges cost at the same rate? 5 oranges?

12. Is 30 an odd number or an even number? Is it prime or composite? What two numbers *multiplied* together make 30?

## SEAT WORK.

1. Copy, and commit to memory:

$$4 \times 5 = 20.$$

$$4 \times 6 = 24.$$

$$4 \times 7 = 28.$$

$$4 \times 8 = 32.$$

$$4 \times 9 = 36.$$

$$4 \times 10 = 40.$$

$$4 \times 11 = 44.$$

$$4 \times 12 = 48.$$

$$5 \times 4 = 20.$$

$$5 \times 5 = 25.$$

$$5 \times 6 = 30.$$

$$5 \times 7 = 35.$$

$$5 \times 8 = 40.$$

$$6 \times 4 = 24.$$

$$6 \times 5 = 30.$$

$$6 \times 6 = 36.$$

$$7 \times 3 = 21.$$

$$7 \times 4 = 28.$$

$$7 \times 5 = 35.$$

$$8 \times 3 = 24.$$

$$8 \times 4 = 32.$$

$$8 \times 5 = 40.$$

$$9 \times 3 = 27.$$

$$9 \times 4 = 36.$$

2. Copy, and fill the blanks:

$$30 = 2 \times \quad 30 = 4 \times$$

$$30 = 3 \times \quad 30 = 5 \times$$



## CLASS WORK.

Here is something new :

$$31\frac{1}{2} \text{ gal.} = 1 \text{ barrel.}$$

1. One barrel is how much more than 30 gal.? How much less than 32 gal.?

2. What is  $\frac{1}{2}$  of 30? What is  $\frac{1}{2}$  of  $1\frac{1}{2}$ ?

3. How many gallons in  $\frac{1}{2}$  barrel?

4. If a vessel hold 32 quarts of water, how many gallons of molasses would it hold?

5. John sold 2 gallons of milk at 4 cents a quart. How much did he receive for it?

6. At 4 cents a pint, what will one gallon of vinegar cost?

7. From 1 barrel of cider there was drawn 1 gal. 2 qt. How much remained?

8. From a barrel of vinegar  $11\frac{1}{2}$  gallons were drawn. How much remained?

9. One-half of what remained was sold to Mr. Smith, and  $\frac{1}{4}$  to Mr. Jones. How much did each buy? How much still remained?

*Give other practical questions of a similar character. Let the pupils ask questions.*

## SEAT WORK.

1. Copy this :

*bbl. stands for barrel.*

$$31\frac{1}{2} \text{ gal.} = 1 \text{ bbl.}$$

2. Copy, and fill the blanks :

$$1 \text{ bbl.} = 30 \text{ gal.} + \text{ gal.}$$

$$1 \text{ bbl.} = 32 \text{ gal.} - \text{ qt.}$$

$$\frac{1}{2} \text{ of } 30 =$$

$$\frac{1}{2} \text{ of } 1\frac{1}{2} =$$

$$\frac{1}{2} \text{ of } 31\frac{1}{2} \text{ gal.} = \text{ gal.}$$

$$\frac{1}{2} \text{ bbl.} = \text{ gal.}$$

$$32 \text{ qt.} = \text{ gal.}$$

$$32 \text{ pt.} = \text{ qt.}$$

$$32 \text{ pt.} = \text{ gal.}$$

$$32 = 8 \times$$

$$32 = 2 \times$$

$$1 \text{ gal.} = \text{ qt.}$$

$$1 \text{ gal.} = \text{ pt.}$$

$$8 \times 4 =$$

3. Write the names of six things that are sold by the barrel.

4. Write five questions about the measuring of liquids.

5. Write the names of five things that are sold by the pint or quart.

6. Write five questions like those in the first column. Write also the answer to each.

## CLASS WORK.

1. What cost 5 pounds of grapes at 6 cents a pound?

2. If 1 lb. of coffee cost 36 cents, what will 4 oz. cost?

3. How many ounces in 2 lbs.?

4. At 4 cents an ounce, what will  $\frac{1}{2}$  pound of tea cost?

5. At 1 cent per ounce, what will 2 lbs. of spices cost?

6. Alice bought 3 books at 4 cents each, and 2 pencils at 10 cents each. What did all cost?

7. How many 2-cent stamps can you buy for 35 cents? How many 3-cent stamps?

8. What cost 2 yards of muslin at 16 cts. a yard? at 19 cts. a yard? at 14 cts. a yard? at 17 cts. a yard?

9. What cost 6 quarts of milk at 6 cents a quart? at 5 cents a quart?

10. What cost 15 feet of tape at 2 cts. a foot? at  $2\frac{1}{2}$  cts. a foot?

*Make up other questions similar to these.*

*Continue work of this kind for several days.*

## SEAT WORK.

1. Write three questions like those in the other column.

2. Write all the odd numbers to 39.

3. Write all the prime numbers below 40.

4. Write all the composite numbers to 40, and the prime factors composing each number; as:

$$36 = 2 \times 2 \times 3 \times 3, \text{ etc.}$$

5.  $\frac{1}{2}$  of 40 =

$\frac{1}{4}$  of 40 =

6. Add the following:

3	12	13	15
5	10	11	3
7	8	2	2
9	6	9	5
<u>11</u>	<u>4</u>	<u>7</u>	<u>14</u>

21	3	4	9
13	5	14	16
6	17	6	3
<u>2</u>	<u>15</u>	<u>12</u>	<u>9</u>

7. Multiply:

16	20	17	15
<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>

13	14	18	19
<u>3</u>	<u>2</u>	<u>2</u>	<u>2</u>

## CLASS WORK.

1. Measure a line 2 rods long.

2. Find how many feet in this line; how many yards.

3. 1 rod = feet.

2 rods = feet.

4. Measure 33 rods along the street.

5. Count the steps you would take in going 33 feet; 33 rods.

6. What is the area of a town lot 11 rods long and 3 rods wide?

7. How many yards in one rod?

$16\frac{1}{2} \div 3$  = how many?

$6 \times 5$  = how many?

$6 \times \frac{1}{2}$  = how many?

$6 \times \frac{1}{2}$  =  $\frac{1}{2}$  of what number?

$6 \times 5\frac{1}{2}$  = how many?

8. How many yards in 2 rods? in 33 feet? Measure and see.

9. One rod is how much less than 20 feet? than 25 feet? than 30 feet? than 33 feet?

10. Two rods is how much more than 20 feet? than 25 feet? than 30 feet? than 33 feet?

## SEAT WORK.

1. Copy, and fill the blanks:

$$33 = 3 \times$$

$$\frac{1}{2} \text{ of } 33 =$$

$$\text{yd.} = 1 \text{ rod.}$$

$$\text{yd.} = 2 \text{ rods.}$$

$$2 \times 5\frac{1}{2} =$$

$$3 \times 5\frac{1}{2} =$$

$$2 \times 16\frac{1}{2} =$$

$$2 \times 16\frac{1}{2} = 3 \times$$

$$2 \times 16\frac{1}{2} = 6 \times$$

$$33 \text{ ft.} = \text{yd.}$$

$$33 \text{ in.} = \text{ft. in.}$$

$$\frac{1}{2} \text{ of } 1 \text{ ft.} =$$

$$\frac{1}{2} \text{ of } 1 \text{ ft.} =$$

$$2 \text{ ft. } 9 \text{ in.} = \text{in.}$$

$$33 \text{ in.} = \text{ft.}$$

2. Write and remember:

$$2 \times 16 = 32.$$

$$2 \times 17 = 34.$$

$$2 \times 18 = 36.$$

$$2 \times 19 = 38.$$

$$2 \times 20 = 40.$$

$$3 \times 11 = 33.$$

$$3 \times 12 = 36.$$

$$3 \times 13 = 39.$$

$$4 \times 8 = 32.$$

$$4 \times 9 = 36.$$

$$4 \times 10 = 40.$$

## CLASS WORK.

1. Charles bought 18 oranges at  $\frac{1}{2}$  cent each. How much did he give for them?

2. He gave in payment five pieces of money, all alike, and received some change. What were the three pieces, and how much change did he receive?

3. What cost 5 yards of ribbon at 7 cents a yard?

4. If 3 dozen apples cost 36 cents, what is the cost of 1 dozen apples? of 1 apple? of 10 apples?

5. If one blank-book cost 9 cents, how much will 4 such books cost? How much will 3?

6. A farmer bought a cow for \$15, two sheep for \$6 each, and a pig for \$11. What did all cost?

7. John bought 3 doz. chickens at  $\frac{1}{2}$  dollar each. How much did they cost a dozen? How much did all cost?

8. If John sold his chickens for \$25, how much did he gain?

9. What will 4 doz. eggs cost at 11 cents a dozen?

*Make up many similar questions.*

## SEAT WORK.

1. Write three questions similar to those in the other column.

2. Draw a square 6-inches. Divide it into square inches.

3. Draw a rectangle 9 inches long which shall have the same area as the above square.

4. Divide the square into two equal triangles.

5. Divide the rectangle into two equal triangles.

6. Write the number of square inches in the square.

7. Write the number of square inches in the rectangle.

8. Write the number of square inches in each triangle.

9. Write the name of each triangle.

10. Remember this:

$$8 \times 5 = 40.$$

$$8 \times 4 = 32.$$

$$8 \times 3 = 24.$$

$$7 \times 6 = 42.$$

$$7 \times 5 = 35.$$

$$7 \times 4 = 28.$$

$$7 \times 3 = 21.$$

$$6 \times 7 = 42.$$

$$6 \times 6 = 36.$$

$$6 \times 5 = 30.$$

## CLASS WORK.

When we have a sum of money composed of dollars and cents, we write the number of dollars and the number of dimes and the number of cents on the same line, placing a period at the left of the dimes, and the sign \$ at the left of the dollars, thus : \$3.13 = three dollars and thirteen cents.

I give each of you a certain sum of money. You may write the sum in figures as I have just shown you.

If there are *no* dimes, you must write the sign 0 at the left of the cents.

*Illustrate by writing various sums of money on the blackboard.*

1. How many dimes in 35 cents? How many dollars in 31 dimes?

2. How many cents in 4 dimes? in 2 dimes? in  $\frac{1}{2}$  dime? in  $2\frac{1}{2}$  dimes?

3. How many dimes in a half-dollar? in a quarter-dollar?

*Ask many similar questions, illustrating with the toy money whenever necessary.*

## SEAT WORK.

1. Write in figures the following :

Ten dollars eighteen cents.

Sixteen dollars ten cents.

Thirty dollars thirty cents.

Twenty-five dollars one cent.

Nineteen dollars twenty cents.

One dollar thirty-three cents.

Nine dollars eight cents.

Three dollars sixteen cents.

Seven dollars seventeen cents.

Five dollars twenty-five cents.

Three dollars four cents.

Three dollars nineteen cents.

Eighteen dollars thirty cents.

Fourteen dollars thirty cents.

Thirty-four dollars ten cents.

2. Write, in words, the following :

\$29.19.      \$36.00.

\$38.07.      \$15.01.

\$16.37.      \$19.27.

\$11.11.      \$39.39.

\$ 9.09.      \$16.99.

\$25.25.      \$33.33.

\$31.12.      \$10.01.

\$15.35.      \$17.30.

\$19.20.      \$12.12.

\$18.01.      \$ 1.01.

\$16.16.      \$21.09.

## CLASS WORK.

1. Frank bought at the store 1 spool of thread for 7 cents, a paper of needles for 10 cents, 2 sheets of paper at 2 cents each, a pen-knife for 15 cents, and a sponge for 2 cents. The store-keeper gave him a bill of his purchases, like the following:

*Frank Filson.*

*To John Jones. Dr.  
Rushville, Indiana.*

## SEAT WORK.

1. Imagine that you make four purchases of small articles, and make out a bill for the same in a form similar to that given below:

<i>Feb. 2</i>	<i>To 1 spool of thread</i>	<i>07</i>	
	<i>1 paper of needles</i>	<i>10</i>	
	<i>2 sheets of paper @ 2¢</i>	<i>04</i>	
	<i>1 pen-knife</i>	<i>15</i>	
	<i>1 sponge</i>	<i>02</i>	
		<i>38</i>	

*Received Payment  
John Jones.*

Let the pupils sell, buy, and make out accurate bills, as in the preceding lessons. But let the purchases now amount to dollars and cents (not exceeding \$40.40). Give the following as a form. In all cases let the actual purchases be made.

*Miss Alice Butler,*

In account with BROWN & CO.,

DEALERS IN DRY GOODS AND NOTIONS.

Mar. 1	To 3 yds. Calico @ 6¢	18	
	1 doz. buttons @ 12¢	12	
	1 parasol	305	
Mar. 2	By 1 doz. buttons @ 12¢ ret'd		12
		335	
	Balance		323

*Rec'd Payment.*

Explain clearly every point in this account. Give the pupils much practice in making others. Let them make actual purchases, and require the seller always to render accurate bills to the buyers.

Several days may be spent with profit upon work of this kind.

## CLASS WORK.

1. How many weeks in 30 working-days? in 30 school-days?

2. If one boy can do a piece of work in 36 days, in how many days can 6 such boys do the same amount of work?

3. How many days in one week? How many weeks in one month? How many days in four weeks?

*Talk about the calendar months and the number of days in each.*

4. How many more days has January than February?

5. How many months contain 31 days? How many only 30 days?

6. What is the greatest number of Sundays that can fall in any month?

7. Can February ever have five Sundays?

8. How many days from the 10th of April to the 1st of May?

9. How many days from the 1st of May to the 10th of June?

10. What is the fourth month in the year? the ninth? the *eleventh*? the *sixth*?

## SEAT WORK.

1. Write the following, and commit it to memory:

1. January	has 31 da.
2. February	" 28 "
(and in leap-years)	29 "
3. March	has 31 "
4. April	" 30 "
5. May	" 31 "
6. June	" 30 "
7. July	" 31 "
8. August	" 31 "
9. September	" 30 "
10. October	" 31 "
11. November	" 30 "
12. December	" 31 "

2. Copy these verses:

"Thirty days hath September,  
April, June, and November,  
And every other thirty-one,  
Excepting February alone,  
Which has but twenty-eight, in fine,  
Till leap-year gives it twenty-nine."

They are sometimes written thus:

"The fourth, eleventh, ninth, and sixth,  
To each have thirty days affixed;  
And every other thirty-one,  
Except the second month alone,  
Which has but twenty-eight, in fine,  
Till leap-year gives it twenty-nine."



## THE NUMBERS FORTY TO FIFTY.

## CLASS WORK.

1. Forty = how many tens?  
How many score? How many dozen?

2. Forty gallons is how much more than a barrel?

3. Forty days is how much more than one month?

4. Forty feet is how much more than 2 rods?

5. Forty hours is how much more than a day?

6. Forty is how many more than 3 dozen?

7. How many ten-dollar bills = 40 dollars?

8. How many dimes in 40 cents? How many half-dimes?

9. What three pieces of money, all different, = 40 cents?

10. How many separate squares can be made with 40 sticks?  $40 \div 4 =$  what?

11. How many quarts in 40 pints? How many gallons in 40 quarts?

12. How many bushels in 40 pecks?

13. How many quarts in 11 gallons?

## SEAT WORK.

1. Memorize the following:

$$2 \times 13 = 26.$$

$$2 \times 14 = 28.$$

$$2 \times 15 = 30.$$

$$2 \times 16 = 32.$$

$$2 \times 17 = 34.$$

$$2 \times 18 = 36.$$

$$2 \times 19 = 38.$$

$$2 \times 20 = 40.$$

2. Copy, and fill the blanks:

$$40 = 16 + 8 + 4 +$$

$$40 = 5 \times$$

$$40 = 4 \times$$

$$40 = 10 \times$$

$$40 = 2 \times$$

$$\frac{1}{2} \text{ of } 40 =$$

$$\frac{1}{4} \text{ of } 40 =$$

$$\frac{1}{2} \text{ of } 40 - \frac{1}{4} \text{ of } 40 =$$

$$\frac{1}{8} \text{ of } 40 =$$

$$\frac{1}{4} \text{ of } 40 - \frac{1}{8} \text{ of } 40 =$$

$$\frac{1}{8} \text{ of } 40 =$$

$$\frac{1}{2} \text{ of } 40 - \frac{1}{8} \text{ of } 40 =$$

$$\frac{1}{16} \text{ of } 40 =$$

$$\frac{1}{8} \text{ of } 40 - \frac{1}{16} \text{ of } 40 =$$

$$\frac{1}{16} \text{ of } 40 =$$

$$\frac{1}{8} \text{ of } 40 - \frac{1}{16} \text{ of } 40 =$$

$$\frac{1}{16} \text{ of } 40 =$$

$$\frac{3}{16} \text{ of } 40 =$$

## CLASS WORK.

1. Measure 40 inches.
2. How much longer is 40 inches than 1 yard?
3. How many inches in 1 yard?
4. Measure 40 feet.
5. Is 40 feet longer or shorter than the length of this school-room? How much? Try it and see.
6. How many yards in 42 feet?
7. Measure 40 yards.
8. Measure 40 rods.

*By this time, with the daily practice so often insisted upon, pupils should be able to add single columns of figures (sum not to exceed 50), very rapidly and accurately.*

*Show now how to add two columns, "carrying" the tens when they occur.*

9. Add together:

*Explain that the sum of the first column = 1 ten and 14*

*5 ones. We write the five ones under the column of ones, and add the ten with the other three tens in the tens column.*

## SEAT WORK.

1. Write all the odd numbers from 1 to 49.
2. Write all the prime numbers below 50.
3. Write the prime factors of 42; of 48; of 49.
4. Write all the divisors of 45; of 48.
5. Write the greatest number that will divide 42; the greatest number that will divide 45; the greatest number that will divide 49.

6. Write these words:

Unit,	Ten,
Units.	Tens.

7. Add:

10	17	16	13	12
3	7	6	12	15
16	13	19	11	10
20	9	7	10	13
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

18	12	11	10	13
10	10	10	8	9
13	8	9	7	17
12	16	14	26	8
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

3. Copy, and fill the blanks:

$$3 \times 10 = \quad 3 \times \frac{1}{2} =$$

$$3 \times 6 = \quad 3 \times 16\frac{1}{2} =$$

$$3 \times 16 = \quad 3 \text{ rods} = \text{ft.}$$

## CLASS WORK.

*Let the pupils sell, buy, and make change,—amounts not to exceed 50 cents, 50 dollars, or \$50.50.*

*Require the seller in every case to make out in proper form a bill of goods sold (see page 182).*

1. How many dimes in one dollar? in one-half of a dollar?

2. How many cents in one dime? in five dimes?

3. How many cents in one-half of a dollar? How many cents in a quarter of a dollar? in two quarters?

4. What five pieces of money make 50 cents? What 6 pieces? What 4 pieces? What 2 pieces?

5. What 5 pieces of money make 25 cents? What 7 pieces? What 3 pieces? What 9 pieces?

6. What 3 pieces of money make 40 cents? What 4 pieces? What 8 pieces?

7. Fifty cents = how many dimes? How many five-cent pieces?

8. How many quarter-dollars make a dollar? How many make  $\frac{1}{2}$  dollar?

## SEAT WORK.

Copy, and fill the blanks:

$$48 = 4 \times$$

$$48 = 2 \times$$

$$48 \text{ in.} = \text{ft.}$$

$$48 \text{ ft.} = \text{yd.}$$

$$48 \text{ pt.} = \text{qt.}$$

$$48 \text{ pt.} = \text{gal.}$$

$$48 \text{ pk.} = \text{bu.}$$

$$48 \text{ da.} = \text{wk. da.}$$

$$48 \text{ da.} = \text{work-days.}$$

$$48 \text{ wk.} = \text{mo.}$$

$$48 \text{ mo.} = \text{yr.}$$

$$\frac{1}{2} \text{ of } 48 =$$

$$\frac{1}{4} \text{ of } 48 =$$

$$\frac{1}{8} \text{ of } 48 =$$

$$\frac{1}{16} \text{ of } 48 =$$

$$\frac{1}{32} \text{ of } 48 =$$

$$\frac{1}{64} \text{ of } 48 =$$

$$\frac{1}{128} \text{ of } 48 =$$

$$\frac{1}{256} \text{ of } 48 =$$

$$\frac{1}{512} \text{ of } 48 =$$

$$\frac{1}{1024} \text{ of } 48 =$$

$$\frac{1}{2048} \text{ of } 48 =$$

$$\frac{1}{4096} \text{ of } 48 =$$

$$\frac{1}{8192} \text{ of } 48 =$$

$$\frac{1}{16384} \text{ of } 48 =$$

$$\frac{1}{32768} \text{ of } 48 =$$

$$\frac{1}{65536} \text{ of } 48 =$$

$$\frac{1}{131072} \text{ of } 48 =$$

$$\frac{1}{262144} \text{ of } 48 =$$

## CLASS WORK.

*Teach how to multiply when the multiplicand exceeds 12.*

1. Multiply 18 by 2.

Observe that  $18 = 8 + 10$ .

$2 \times 8 =$  how many?

16 = how many tens and units?

$2 \times 10 =$  how many?

20 = how many tens?

$8 + 10 =$  how many?

$2 \times 18 =$  how many?

2. Two times 23 are how many?

Write the numbers in this way, and multiply the upper figure by the lower :

$$\begin{array}{r} 23 \\ 2 \\ \hline \end{array}$$

3. Two times 19 are how many?

4. Three times 15 are how many?

5. Three times 16 are how many?

6. How many feet in 14 yards? in 16 yards?

*Explain, and give examples, until the pupils understand perfectly.*

## SEAT WORK.

1. Multiply the following numbers together :

$$\begin{array}{r} 15 \\ 3 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ 4 \\ \hline \end{array} \quad \begin{array}{r} 24 \\ 2 \\ \hline \end{array} \quad \begin{array}{r} 16 \\ 2 \\ \hline \end{array} \quad \begin{array}{r} 13 \\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 17 \\ 2 \\ \hline \end{array} \quad \begin{array}{r} 16 \\ 3 \\ \hline \end{array} \quad \begin{array}{r} 14 \\ 3 \\ \hline \end{array} \quad \begin{array}{r} 19 \\ 2 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ 2 \\ \hline \end{array}$$

2. Add together :

$$\begin{array}{r} 15 \\ 15 \\ 15 \end{array} \quad \begin{array}{r} 12 \\ 12 \\ 12 \end{array} \quad \begin{array}{r} 24 \\ 24 \\ 24 \end{array} \quad \begin{array}{r} 16 \\ 16 \\ 16 \end{array} \quad \begin{array}{r} 13 \\ 13 \\ 13 \end{array}$$

$$\begin{array}{r} 17 \\ 17 \end{array} \quad \begin{array}{r} 16 \\ 16 \end{array} \quad \begin{array}{r} 14 \\ 14 \end{array} \quad \begin{array}{r} 19 \\ 19 \end{array} \quad \begin{array}{r} 18 \\ 18 \end{array}$$

$$\begin{array}{r} 21 \\ 21 \\ 8 \end{array} \quad \begin{array}{r} 22 \\ 22 \\ 6 \end{array} \quad \begin{array}{r} 23 \\ 23 \\ 4 \end{array} \quad \begin{array}{r} 24 \\ 24 \\ 2 \end{array}$$

3. Write all the prime numbers below 50.

4. Write all the composite numbers to 50, and also the prime numbers composing each. Thus,

$$4 = 2 \times 2.$$

$$6 = 2 \times 3.$$

$$8 = 2 \times 2 \times 2.$$

## CLASS WORK.

1. Alice has 48 blocks; she gives Fred 15 of them. How many has she left?

Write the numbers thus, and then subtract:

$$\begin{array}{r} 48 \\ 15 \\ \hline \end{array}$$

*Teach now how to subtract when the lower figure is greater than the upper.*

2. Frank had 32 blocks, and lost 17. How many had he left?

$32 - 17 =$  how many?

Write the numbers thus:

$$\begin{array}{r} 32 \\ 17 \\ \hline \end{array}$$

Seven units from 2 units = how many?

*Explain how we add ten units to the upper number, making 12 units; and one ten to the lower number, making two tens.*

We then say:

7 from 12 = 5.

2 from 3 = 1.

$32 - 17 = 15$ .

*Give additional examples.*

## SEAT WORK.

1. Subtract the lower number from the upper in each of the following examples:

$$\begin{array}{r} 37 \\ 16 \\ \hline \end{array} \quad \begin{array}{r} 39 \\ 13 \\ \hline \end{array} \quad \begin{array}{r} 46 \\ 24 \\ \hline \end{array} \quad \begin{array}{r} 49 \\ 31 \\ \hline \end{array} \quad \begin{array}{r} 43 \\ 22 \\ \hline \end{array}$$

$$\begin{array}{r} 29 \\ 17 \\ \hline \end{array} \quad \begin{array}{r} 26 \\ 16 \\ \hline \end{array} \quad \begin{array}{r} 38 \\ 11 \\ \hline \end{array} \quad \begin{array}{r} 47 \\ 25 \\ \hline \end{array} \quad \begin{array}{r} 45 \\ 30 \\ \hline \end{array}$$

2. Copy, and fill the blanks:

$$36 = 3 \times$$

$$36 = 4 \times$$

$$49 = 7 \times$$

$$45 = 5 \times$$

$$42 = 7 \times$$

$$42 \text{ da.} = \text{ wk.}$$

3. Subtract the lower number from the upper in each of the following examples:

$$\begin{array}{r} 37 \\ 19 \\ \hline \end{array} \quad \begin{array}{r} 33 \\ 17 \\ \hline \end{array} \quad \begin{array}{r} 46 \\ 28 \\ \hline \end{array} \quad \begin{array}{r} 43 \\ 18 \\ \hline \end{array} \quad \begin{array}{r} 42 \\ 27 \\ \hline \end{array}$$

$$\begin{array}{r} 23 \\ 15 \\ \hline \end{array} \quad \begin{array}{r} 35 \\ 16 \\ \hline \end{array} \quad \begin{array}{r} 41 \\ 22 \\ \hline \end{array} \quad \begin{array}{r} 45 \\ 27 \\ \hline \end{array} \quad \begin{array}{r} 44 \\ 29 \\ \hline \end{array}$$

4. Copy, and fill the blanks:

$$50 = 2 \times$$

$$50 = 5 \times$$

$$\frac{1}{2} \text{ of } 50 =$$

$$\frac{1}{5} \text{ of } 50 =$$

## THE NUMBERS FIFTY TO SIXTY.

## CLASS WORK.

1. How many tens in 50?  
in 60?

2. Fifty = how many times  
5? how many times 25?

3. Measure 50 feet.

4. Measure 3 rods.

5. Which is more, 50 feet  
or 3 rods? How much?

6. How much more than a  
month is 50 days?

7. How many weeks in 50  
days?

8. How many weeks in 50  
school-days?

9. How many days in 50  
hours?

10. How many 25-ct. pieces  
= 50 cts.?

11. How many dimes in a  
dollar? How many in half a  
dollar?

12. Which is more, 40 cts. or  
 $\frac{1}{2}$  dollar? How much?

13. From 50 cents take two  
dimes.

14. Count to 50 by 5's; by  
10's; by 12's. Count backward  
from 50 by 2's; by 3's; by 5's;  
by 10's.

## SEAT WORK.

1. Copy, and fill the blanks:

$$\frac{1}{2} \text{ of } 50 = 5 \times$$

$$\frac{1}{4} \text{ of } 50 = 2 \times$$

$$5 \times = 50.$$

$$3 \times = 51.$$

$$4 \times = 52.$$

$$2 \times = 52.$$

$$2 \times = 54.$$

$$3 \times = 54.$$

$$6 \times = 54.$$

$$5 \times = 55.$$

$$7 \times = 56.$$

$$4 \times = 56.$$

$$2 \times = 56.$$

$$3 \times = 57.$$

$$2 \times = 58.$$

2. Memorize this:

$$5 \times 4 = 20.$$

$$5 \times 5 = 25.$$

$$5 \times 6 = 30.$$

$$5 \times 7 = 35.$$

$$5 \times 8 = 40.$$

$$5 \times 9 = 45.$$

$$5 \times 10 = 50.$$

$$5 \times 11 = 55.$$

$$5 \times 12 = 60.$$

$$6 \times 10 = 60.$$

$$6 \times 11 = 66.$$

CLASS WORK.

1. How many tens in 60?  
How many dozens? How many score?

2. Measure a line 60 feet long.

3. How many yards in 60 ft.? How many rods?

4. How many months in 60 days?

5. How many weeks in 56 days? in 60 days?

6. How many years in 60 months?

7. Name two months which together have 60 days. Name two which together have less than 60 days.

8. How many days in 60 hours?

Learn this:

60 minutes = 1 hour.

60 seconds = 1 minute.

9. How many minutes in  $\frac{1}{2}$  hour? in  $\frac{1}{4}$  hour? in  $\frac{3}{4}$  hour?

10. How many seconds in  $\frac{1}{2}$  minute? in  $\frac{1}{4}$  minute? in  $\frac{3}{4}$  minute?

11. 30 minutes = what part of an hour? 15 minutes = what part?

SEAT WORK.

1. Add the following:

13	5	16	14
17	18	4	15
19	23	23	16
<u>9</u>	<u>12</u>	<u>16</u>	<u>13</u>

8	9	15	14
14	17	25	8
17	8	17	7
<u>19</u>	<u>16</u>	<u>3</u>	<u>27</u>

2. Find the difference between the numbers in each of the following pairs:

53	57	44	56
<u>18</u>	<u>39</u>	<u>28</u>	<u>37</u>
60	52	47	48
<u>42</u>	<u>36</u>	<u>29</u>	<u>37</u>

3. Multiply the following:

14	13	17	27
<u>4</u>	<u>4</u>	<u>3</u>	<u>2</u>
16	$\frac{1}{2}$	16 $\frac{1}{2}$	
<u>3</u>	<u>3</u>	<u>3</u>	

4.  $4 \times 12 =$   
 $4 \times \frac{1}{2} =$   
 $4 \times 12\frac{1}{2} =$   
 $\frac{1}{2}$  of 50 =

## CLASS WORK.

1. How many yards in 54 feet?

2. Draw a rectangle 9 ft. long and 6 ft. wide.

3. Divide it into square yards. How many?

4. Divide it into square feet. How many?

5. A strip of carpet is 18 ft. long and 1 yd. wide. How many square yards does it contain?

6. How many square feet?

7. A flower-bed is 28 ft. long and 2 ft. wide. What is its area?

8. What is the distance around its edge?

9. Another is 14 ft. long and 4 ft. wide. What is its area?

10. What is the distance around its edge?

11. A third bed is 8 ft. long by 7 ft. wide. What is its area? the distance around its edge?

12. What is the area of a board 12 ft. long and 1 ft. wide? of one 12 ft.  $\times$  4 in.?

13. What is the area of 15 such boards as the last?

*Continue work of this kind for several days.*

## SEAT WORK.

1. Draw a square 7-inches.

2. Divide it into square inches.

3. Copy, fill the blanks, and memorize, if not already learned:

$$2 \times 2 =$$

$$3 \times 3 =$$

$$4 \times 4 =$$

$$5 \times 5 =$$

$$6 \times 6 =$$

$$7 \times 7 =$$

4. Copy:

$$2^2 = 4.$$

$$3^2 = 9.$$

$$4^2 = 16.$$

$$5^2 = 25.$$

$$6^2 = 36.$$

$$7^2 = 49.$$

5. Write the result of each of the following statements:

$$3^2 - 2^2 =$$

$$4^2 - 3^2 =$$

$$5^2 - 4^2 =$$

$$6^2 - 5^2 =$$

$$7^2 - 6^2 =$$

6. Draw a rectangle 1 foot long and 5 inches wide.

7. Divide it into square inches.



## CLASS WORK.

## Review.

1. Here is a block, each edge of which is 1 inch. What is it called?

2. Here is one, each edge of which is 2 inches. What is it called?

3. This second block is 2 in. wide, 2 in. long, and 2 in. thick.

$$2 \times 2 \times 2 = 8.$$

4. How many of the smaller blocks would be required to make one of the larger?

5. We say that the *contents* of the smaller block = 1 cubic inch.

6. And that the *contents* of the larger = 8 cu. in.

7. Here is an oblong block 12 inches long, 1 in. wide, 1 in. thick. What are its contents?

8.  $12 \times 1 \times 1 =$  what?

To find the contents of a cubical body, we multiply together the length, breadth, and thickness.

9. Find the contents of a box 4 inches long, 3 inches wide, 2 inches deep.

## SEAT WORK.

1. Copy, fill the blanks, and memorize:

$$2 \times 2 \times 2 =$$

$$3 \times 3 \times 3 =$$

$$4 \times 4 \times 4 =$$

The cube of 3 =

The cube of 4 =

2. Write these words:  
Cube, Cubical Body.  
Contents.  
Solid Contents.

3. Here is a box. Find its contents, or, in other words, the number of cubic inches it will contain.

*NOTE TO THE TEACHER. Each pupil should be given a paper box to measure. The box should contain not more than 64 cubic inches, and its length, breadth, and depth should be an integral number of inches.*

4. Find the area of each side of the box; of each end; of the top.

5. Find its entire area.

6. Find the contents and area of another box half as long, but of the same width and depth.

## CLASS WORK.

*The lessons for several days may be occupied in measuring :*

(1) *Lengths, not exceeding 60 inches, 60 feet, 60 yards, or 60 rods.* (2) *Areas, not exceeding 60 square inches, or 60 square feet.* (3) *Contents, not exceeding 60 cubic inches, or 60 cubic feet.*

*Teach the meaning of the word capacity.*

1. Measure a line 60 inches long. How many feet in length is it?

2. How many steps do you take in walking a distance of 60 feet?

3. Measure and stake off a plot of ground 60 yards square.

4. How many rods in length is each side of this plot? Measure and see how many rods of fence would be required to enclose it.

5. How many square inches in a pasteboard 6 inches wide and 9 inches long?

6. How many cards, each 3 inches square, can be cut from it?

## SEAT WORK.

1. Find the solid contents of a wooden block 6 inches long, 1 inch wide, and 1 inch thick.

2. Find the solid contents of a wooden block 6 inches long, 4 inches wide, and 1 inch thick.

3. Find the capacity in cubic inches of a box 7 inches long, 6 inches wide, and 1 inch deep.

4. Find the capacity in cubic feet of a box 6 ft. long, 3 ft. wide, and 3 ft. deep.

5. Find the capacity in cubic feet of a trench 30 ft. long, 1 ft. wide, and 2 ft. deep.

6. Find the solid contents of a wooden beam 14 feet long and 2 feet square.

7. Copy, and fill the blanks :

$$\frac{1}{4} \text{ of } 40 = \quad \frac{1}{4} \text{ of } 60 =$$

$$\frac{1}{4} \text{ of } 48 = \quad \frac{1}{4} \text{ of } 56 =$$

$$\frac{2}{4} \text{ of } 40 = \quad \frac{2}{4} \text{ of } 60 =$$

$$\frac{1}{2} \text{ of } 40 = \quad \frac{1}{2} \text{ of } 60 =$$

$$\frac{3}{4} \text{ of } 40 = \quad \frac{3}{4} \text{ of } 60 =$$

$$\frac{1}{2} \text{ of } 60 = \quad \frac{3}{4} \text{ of } 60 =$$

$$\frac{1}{10} \text{ of } 40 = \quad \frac{3}{10} \text{ of } 40 =$$

$$\frac{1}{10} \text{ of } 50 = \quad \frac{3}{10} \text{ of } 50 =$$

$$\frac{1}{10} \text{ of } 60 = \quad \frac{3}{10} \text{ of } 60 =$$

$$\frac{5}{10} \text{ of } 60 = \quad \frac{6}{10} \text{ of } 60 =$$

$$\frac{7}{10} \text{ of } 60 = \quad \frac{9}{10} \text{ of } 60 =$$

## THE NUMBERS SIXTY TO SEVENTY.

## CLASS WORK.

1. Repeat what you have already learned :

Sixty Seconds = One Minute.

Sixty Minutes = One Hour.

2. Count 60 ; count to 60 by 2's ; by 3's ; by 4's ; by 5's ; by 6's.

3. How many seconds in half a minute ?

4. How many minutes in half an hour ? in  $\frac{1}{4}$  hour ?

5. What part of an hour is 10 minutes ? 5 minutes ? 20 minutes ? 40 minutes ?

6. What part of a minute is 30 seconds ? 15 seconds ? 10 seconds ?

7. How many days in 60 hours ?

8. How many weeks in 60 work-days ?

9. How many months in 60 days ?

10. How many years in 60 months ?

11. How many are three score ? two score ?

12. How many are two score and ten ? three score and ten ?

## SEAT WORK.

1. Write all the odd numbers to 69.

2. Write all the prime numbers below 70.

3. Write the prime factors of 60.

4. Write the prime factors of 64.

5. Write all the divisors of 63.

6. Write the divisors of 62.

7. Write all the divisors of 64.

8. Write the divisors of 65.

9. Write the divisors of 66.

10. Write the divisors of 68.

11. Write the divisors of 69.

12.  $\frac{1}{2}$  of 64 =  $\frac{1}{4}$  of 64 =

$\frac{1}{8}$  of 64 =  $\frac{1}{16}$  of 64 =

13. Be sure to memorize all of the following that you do not already know :

$$4 \times 8 = 32.$$

$$4 \times 9 = 36.$$

$$4 \times 10 = 40.$$

$$4 \times 11 = 44.$$

$$4 \times 12 = 48.$$

$$5 \times 9 = 45.$$

$$5 \times 10 = 50.$$

## CLASS WORK.

1. Sixty-one is how many more than 31? than 21? than 25?

2. What are the divisors of 62?

3. One-half of 62 is how many more than  $\frac{1}{2}$  of 50?

4. What two summer months together contain 62 days?

5. How many quarts in 62 pints? How many gallons?

6. If a man can build 12 rods of fence in a day, how many days will it take him to build 62 rods?

7. If you should buy a quart of milk every day during July, how many pints would you buy in the month?

8. Measure 63 feet.

9. Measure 20 yards.

10. Walk 63 feet, and count your steps.

11. At 10 cents a dozen, what will 60 apples cost?

12. Buy 9 yards of ribbon for 63 cents. How much is that a yard?

*Make up many other questions like the above.*

## SEAT WORK.

1. Write in columns four sets of numbers, five numbers in each set, the sum of each set being equal to 62.

2. Write 5 pairs of odd numbers, the sum of each pair of which equals 62.

3. Write 5 pairs of even numbers, the sum of each pair of which equals 62.

4. Draw a right triangle 6 inches long by 3 inches high.

5. What is its area?

6. Draw a rectangle of the same length and width. What is its area?

7. Draw a square having the same area as the triangle.

8. Copy, and fill the blanks:

$$63 = 7 \times$$

$$63 = 3 \times$$

$$63 \text{ ft.} = \text{yd.}$$

$$60 = \text{dozen.}$$

$$\frac{1}{2} \text{ of } 63 =$$

$$63 = 15 + 8 + 6 +$$

$$63 - 35 =$$

$$63 - 18 =$$

$$6)63$$

$$12)63$$

## CLASS WORK.

1. What is the square of 8?

The square of a number is indicated by writing a small figure 2 at the right and near the top of the figure expressing the number, thus :

$$2^2 = 2 \times 2 = 4.$$

$$3^2 = 3 \times 3 = 9, \text{ etc.}$$

2. Draw a square 8-inches. Divide it into square inches.

3. Measure a garden-bed 8 feet square. How many square feet?

4. What is the length of another garden-bed 2 ft. wide and containing the same area?

5. What is the distance around the edge of the first garden-bed? What is the distance around the edge of the second?

6. How many square yards of carpet will cover a room 7 yd. wide and 9 yd. long?

7. What is the area of one side of a board 15 ft. long and 2 ft. wide? The area of two such boards?

*Extend the work by giving further examples.*

## SEAT WORK.

1. Write the squares of all the numbers from 1 to 8, according to the following form :

$$1^2 = 1 \times 1 = 1.$$

$$2^2 = 2 \times 2 = 4, \text{ etc.}$$

2. Draw a square 8-inches. Divide it into square inches.

3. Draw an oblong 7 in. wide and 9 in. long.

4. Divide this oblong into three smaller equal oblongs.

5. Divide each of these smaller oblongs into two equal triangles.

6. Copy, and commit to memory :

$$6 \times 4 = 24.$$

$$6 \times 5 = 30.$$

$$6 \times 6 = 36.$$

$$6 \times 7 = 42.$$

$$6 \times 8 = 48.$$

$$6 \times 9 = 54.$$

$$6 \times 10 = 60.$$

$$6 \times 11 = 66.$$

$$6 \times 12 = 72.$$

$$7 \times 5 = 35.$$

$$7 \times 6 = 42.$$

$$7 \times 7 = 49.$$

$$7 \times 8 = 56.$$

$$7 \times 9 = 63.$$

$$7 \times 10 = 70.$$

## CLASS WORK.

1. How many pounds in 64 ounces?

2. How many days in 9 weeks?

3. How many pecks in 64 quarts? How many bushels?

4. At 2 dollars a bushel, how many bushels of wheat can be bought for \$64?

5. Bought of John Doe, 15 bbl. of potatoes at \$2 a bbl., 19 bu. of oats at \$1 a bu., 36 chickens at \$3 a dozen. Make out a bill in proper form, and let John Doe acknowledge payment.

6. Make 5 purchases (the amount not exceeding 64 cents), and write a bill in due form.

7. Bought 2 bbl. of molasses at \$1 a gallon. What was the cost?

8. In 7 weeks and 1 day, how many days? In 9 weeks how many days? In 56 days how many weeks?

9. If 16 pints of milk cost 64 cents, what does 1 gallon cost? 1 quart?

*Make up other questions similar to the above.*

## SEAT WORK.

1. Copy, and fill the blanks:

63 da. = wk.

63 wk. = mo. wk.

63 mo. = yr. mo.

63 gal. = bbl.

64 oz. = lb.

64 pt. = qt.

64 pt. = gal.

64 qt. = gal.

64 qt. = pk.

64 pk. = bu.

64 qt. = bu.

$16 + 16 + 16 + 16 =$

$4 \times 16 =$

$2 \times 2 \times 2 \times 2 \times 2 \times 2 =$

70 da. = wk.

70 wk. = mo.

70 hr. = da.

70 min. = hr. min.

70 = doz. +

70 = score +

70 oz. = lb.

70 qt. = gal.

70 gal. = bbl.

10 min. = hr.

12 min. = hr.

15 min. = hr.

20 min. = hr.

30 min. = hr.

## CLASS WORK.

1. If I earn \$14 in a week, how much will I earn in a month?

2. If 1 lb. of spices cost 64 cents, what will 1 oz. cost? 3 oz.? 8 oz.?  $\frac{1}{2}$  lb?

3. John is 7 years old, and his uncle is nine times as old. How old is his uncle?

4. If you earn 5 cents every day for 2 weeks, how much do you earn altogether?

5. What three pieces of money together make 65 cents?

6. If you attend school 6 hours each day, how many hours do you attend in 2 weeks?

7. Buy at the grocery store 2 cakes of soap at 10 cts. a cake, 2 lbs. of coffee at 16 cents a pound;  $\frac{1}{2}$  lb. of cheese at 20 cts. a pound;  $\frac{1}{2}$  doz. lemons at 16 cts. a dozen. Make out a bill.

8. Make five other purchases at the grocery store, and make out a bill.

9. Sell five articles at a dry-goods store, and make the bill.

*Make up other similar questions.*

## SEAT WORK.

1. Make up five questions similar to those in the other column.

2. Add these columns:

13	17	32	2	3
12	7	12	12	9
19	28	14	22	12
16	6	3	7	15
<u>9</u>	<u>9</u>	<u>6</u>	<u>14</u>	<u>18</u>

3. Multiply:

18	17	16	13	12
<u>3</u>	<u>4</u>	<u>4</u>	<u>5</u>	<u>4</u>

4. Subtract:

63	58	65	70	51
<u>49</u>	<u>39</u>	<u>57</u>	<u>35</u>	<u>26</u>

5.  $\frac{1}{10}$  of 60 =  
 $\frac{1}{5}$  of 63 =  
 $\frac{1}{4}$  of 64 =  
 $\frac{1}{3}$  of 65 =  
 $\frac{1}{2}$  of 66 =  
 $\frac{1}{4}$  of 64 =  
 $\frac{1}{2}$  of 68 =  
 $\frac{1}{3}$  of 69 =

6. Write a bill of goods in as neat a style as it is possible to be written.

## CLASS WORK.

1. Measure 4 rods.
2. Along the same line measure 66 feet. Which of these two lines is the longer?

3. A surveyor's chain is 4 rods long. Learn this:

$$4 \text{ rods} = 1 \text{ chain.}$$

4. Measure 40 rods down the street.

5. Cut a string or cord 1 chain in length.

6. How many chains in 40 rods?

7. What is the width of the school yard in chains? What is its length?

8. What is the distance around the school yard?

9. How many rods in 2 chains? in 4 chains?

10. If a certain lot is 4 rods wide and 4 chains long, how many square rods does it contain?

11.  $\frac{1}{4}$  of 66 feet = what?

*Give other practical exercises in measuring similar to the above. Many questions will suggest themselves as the work goes forward.*

## SEAT WORK.

1. Copy, and fill the blanks:

$$4 \times 16\frac{1}{2} =$$

$$66 \div = 16\frac{1}{2}.$$

$$11 \times = 66.$$

$$3 \times = 66.$$

$$2 \times = 66.$$

$$\frac{1}{2} \text{ of } 66 =$$

$$\frac{1}{2} \text{ of } 66 = 3 \times$$

2. Write:

$$12 \text{ in.} = 1 \text{ foot.}$$

$$3 \text{ ft.} = 1 \text{ yard.}$$

$$16\frac{1}{2} \text{ ft.} = 1 \text{ rod.}$$

$$5\frac{1}{2} \text{ yd.} = 1 \text{ rod.}$$

$$4 \text{ rd.} = 1 \text{ chain.}$$

$$22 \text{ yd.} = 1 \text{ chain.}$$

$$66 \text{ ft.} = 1 \text{ chain.}$$

3. Copy, and fill the blanks:

$$\frac{1}{2} \text{ chain} = \text{ rods.}$$

$$\frac{1}{2} \text{ chain} = \text{ ft.}$$

4. Measure a plot of ground 1 rod long and 5 yd. wide.

5. Divide it into square yards. How many yards of fence would enclose it?

6. Write directions for five exercises in measuring, similar to those given in the opposite column.



## CLASS WORK.

1. How many bushels in 68 pecks?

2. At \$2 a bushel, how many bushels of apples can be bought for \$64?

3. If a boy earn \$4 a week, how much will he earn in four months?

4. A side-walk is 1 yd. wide and 66 feet long. How many square yards are contained in its surface?

5. A room is 6 yd. long and 5 yd. wide. What is its area?

6. What is the distance in feet around the same room?

7. What prime numbers multiplied together make 68?

8.  $\frac{1}{4}$  of 68 = what?

$\frac{1}{3}$  of 69 = what?

$\frac{1}{5}$  of 64 = what?

9. One-eighth of 64 is how many more than  $\frac{1}{16}$  of 60?

10. Buy 5 articles at a bookstore. Make out a bill for the same.

11. Imagine yourself a farmer, and sell six different farm products. Make out a bill.

## SEAT WORK.

1. What prime numbers multiplied together make 64? What pairs of composite numbers multiplied together make 64?

2. Find the prime factors of each of the following numbers:

56	48	36	28	62
63	42	32	54	39

3. Copy, and fill the blanks:

$$69 \div 3 =$$

$$68 \div 4 =$$

$$66 \div 11 =$$

$$63 \div 9 =$$

$$63 \div 3 =$$

$$56 \div 4 =$$

$$52 \div 13 =$$

4. Multiply:

16	13	11	17	14
<u>4</u>	<u>5</u>	<u>6</u>	<u>4</u>	<u>5</u>

12	21	32	9	13
<u>5</u>	<u>3</u>	<u>2</u>	<u>7</u>	<u>4</u>

5. Copy, and fill the blanks:

$$16 + 16 + 16 + \quad = 64.$$

$$17 + 15 + 13 + 11 =$$

$$\frac{1}{2} \text{ of } 68 - 4 =$$

$$\frac{1}{4} \text{ of } 63 = 3 \times$$

## THE NUMBERS SEVENTY TO EIGHTY.

## CLASS WORK.

1. What numbers between 70 and 80 are divisible by 3?
2. Name the five prime factors of 72.
3. Name the three prime factors of 75.
4. What is the largest number that will divide both 70 and 80?

We say, then, that 10 is the greatest common divisor of 70 and 80.

5. What is the greatest common divisor of 24 and 30? of 16 and 28? of 50 and 75?

6. What numbers between 70 and 80 are divisible by 6?

7. How many 25's in 75? How many 15's?

8. What two numbers added together make 72?

9. How many weeks in 70 days? How many months?

10. How many minutes in 1 hr. 10 min.? How many hours in 3 days?

11. If a man work 6 hours per day, in how many days will *he have worked* 72 hours?

## SEAT WORK.

1. Write all the prime numbers from 1 to 79.
2. Write the composite numbers between 70 and 80.
3. Write the divisors or factors of each of these composite numbers.
4. Write this, and commit it to memory :

$$5 \times 12 = 60.$$

$$6 \times 10 = 60.$$

$$6 \times 11 = 66.$$

$$6 \times 12 = 72.$$

$$7 \times 9 = 63.$$

$$7 \times 10 = 70.$$

$$7 \times 11 = 77.$$

$$8 \times 8 = 64.$$

$$8 \times 9 = 72.$$

$$8 \times 10 = 80.$$

$$9 \times 7 = 63.$$

$$9 \times 8 = 72.$$

$$10 \times 6 = 60.$$

$$10 \times 7 = 70.$$

$$11 \times 6 = 66.$$

$$11 \times 7 = 77.$$

$$12 \times 5 = 60.$$

$$12 \times 6 = 72.$$

$$3 \times 25 = 75.$$

$$4 \times 20 = 80.$$

## CLASS WORK.

1. Measure a line 72 inches long.

2. How many feet in 72 inches?

3. Measure a line 75 feet long.

4. How many yards in 75 feet?

5. Seventy-five feet is how much more than 4 rods?

6. Measure the distance of 80 rods along the street or road.

7. How many chains in 80 rods?

Eighty rods also = one-quarter of a mile.

*Give other practical work in measuring distances.*

8. Draw on the blackboard a rectangle 72 inches long by 12 inches wide.

9. What is its area in square inches? in square feet?

10. A flower-bed is 24 yd. long and 3 yd. wide. What is its area?

11. Here is a board. Measure its length and width, and find the area of one side of it.

## SEAT WORK.

1. Copy, and fill the blanks:

$$75 = 3 \times$$

$$75 = 5 \times$$

$$75 = 50 +$$

$$75 \text{ in.} = \text{ft. in.}$$

$$75 \text{ ft.} = \text{yd.}$$

$$75 \text{ da.} = \text{wk. da.}$$

$$75 \text{ hr.} = \text{da. hr.}$$

$$75 \text{ min.} = \text{hr. min.}$$

$$75 \text{ sec.} = \text{min. sec.}$$

2. Copy, and fill the blanks:

$$6 \times 12 =$$

$$8 \times 10 =$$

$$(\frac{1}{2} \text{ of } 80) + (\frac{1}{2} \text{ of } 70) =$$

$$(8 \times 5) + (6 \times 6) =$$

3. Draw a rectangle 9 in. long and 8 in. wide.

4. Divide it into square inches.

5. Draw another rectangle having the same area, but being 12 in. long.

6. Draw a triangle having half the area of either of these rectangles.

7. Select one of a dozen objects designated by the teacher, and find its area.

## CLASS WORK.

1. Here are three boards. Measure them, and compute their areas. What is the sum of their areas?

2. Here is a box. Measure it, and find its capacity in cubic inches.

3. Here is a board. Measure it, and find its solid contents.

*NOTE. The box should not be larger than  $9 \times 4 \times 2$ .*

*The board should not be larger than  $10 \times 8 \times 1$ .*

*Continue practical work in measurements of length, area, and capacity.*

4. What cost two barrels of molasses at \$1 a gallon?

5. At 8 cents a quart, what will 18 pints of milk cost?

6. If a milkman sells  $4\frac{1}{2}$  gallons of milk in a day, how many gallons will he sell in 4 days? How many quarts?

7. If 10 bushels of wheat cost \$20, how many bushels can be bought for \$80?

8. How many bushels in 76 pecks?

*Make up other questions.*

## SEAT WORK.

1. Copy, and fill the blanks:

$$2 \times 2 \times 2 =$$

$$3 \times 3 \times 3 =$$

$$4 \times 4 \times 4 =$$

$$2^3 = \quad 4^3 = \quad 3^2 = \quad 5^2 = \quad 7^2 =$$

$$3^3 = \quad 2^2 = \quad 4^2 = \quad 6^2 = \quad 8^2 =$$

2. Draw a square that shall contain 64 sq. in.

3. Draw an oblong that shall contain 63 sq. in.

4. Make up five questions similar to those in the other column, and write the answer to each.

5. Copy, and fill the blanks:

$$10 \text{ bu.} = \text{pk.}$$

$$2 \text{ bbl.} = \text{gal.}$$

$$4\frac{1}{2} \text{ gal.} = \text{qt.}$$

$$4\frac{1}{2} \text{ gal.} = \text{pt.}$$

$$18 \text{ gal.} = \text{qt.}$$

$$\frac{1}{2} \text{ bbl.} = \text{gal.}$$

$$18 \text{ gal.} - \frac{1}{2} \text{ bbl.} = \text{gal.}$$

6. Fill the blanks, and commit to memory:

$$3 \times 20 =$$

$$4 \times 20 =$$

$$2 \times 25 =$$

$$3 \times 25 =$$

$$4 \times 15 =$$

## CLASS WORK.

1. Buy 16 yd. of silk at \$4 a yard, and 2 yd. of cloth at \$5½ a yard.

2. Give four \$20 bills in payment. How much change should you receive?

3. If ½ lb. of coffee cost 13 cents, what will 3 pounds cost?

4. If 10 apples are sold for 5 cents, what is the cost of one apple? of a dozen apples?

5. Buy 2 watches at \$18 each, and 3 watches at \$13 each. What do all cost?

6. Sell the above five watches at \$15 each. Do you gain, or lose? How much?

7. Buy five articles at a dry-goods store, and let the clerk make out your bill.

8. Tell how the different parts of a bill should be written.

*Show the children how to keep simple accounts of expenditures. A part of several recitations may be spent in this work. It would be well if each child had a little pass-book of his own, and made entries in it according to the teacher's directions.*

## SEAT WORK.

1. Write five questions similar to those in the other column.

2. Suppose you are a grocer, and sell five articles to Richard Roe. Make out a bill in due form for his purchases.

Be very careful that all your work is exact, easy to be read and understood, and neat in appearance.

3. Make out another bill of five articles which a farmer might sell to Jacob Thomson.

4. Make out another bill of five articles bought for Christmas presents.

5. What numbers will exactly divide 72? 75? 76? 78? 80?

6.  $\frac{1}{2}$  of 75 =

$\frac{1}{3}$  of 75 =

$\frac{1}{4}$  of 75 -  $\frac{1}{5}$  of 75 =

$\frac{1}{2}$  of 80 =

$\frac{1}{3}$  of 80 =

$\frac{1}{4}$  of 80 -  $\frac{1}{5}$  of 80 =

$\frac{1}{2}$  of 80 +  $\frac{1}{3}$  of 80 =

$\frac{1}{2}$  of 72 =

$\frac{1}{3}$  of 72 =

$\frac{1}{4}$  of 72 -  $\frac{1}{5}$  of 72 =

$\frac{1}{2}$  of 72 +  $\frac{1}{3}$  of 72 =

## CLASS WORK.

## Review.

*Pupils should have every day some practice in rapid addition and ready multiplication. Read again the directions given in preceding lessons for this kind of work.*

*Teach the multiplication and division of numbers,—the product or the dividend in no case exceeding 80.*

*Give frequent practice in subtraction,—the lower unit figure being greater than the upper.*

*Give more practical work in buying, selling, making out bills, making change, receipting bills.*

*Let the pupils write on the board a good form of bill, made from actual purchases.*

*Bills should now be made on paper of uniform size and quality, and all the writing should be with pen and ink. Better a little work done each day with great care than much indifferent work done hastily.*

*Require not only accuracy, but neatness of work, including good penmanship and careful ruling.*

## SEAT WORK.

1. Add these columns:

	9	15	17
16	8	16	6
13	19	17	8
17	18	14	15
18	29	13	9
<hr/>	<hr/>	<hr/>	<hr/>

14	13	15	12
12	8	13	19
7	9	17	7
24	16	19	17
19	17	16	8
<hr/>	<hr/>	<hr/>	<hr/>

2. Copy, and fill the blanks:

$$76 \div 19 =$$

$$72 \div 24 =$$

$$64 \div 16 =$$

$$56 \div 14 =$$

$$72 \div 18 =$$

$$75 \div 15 =$$

$$74 \div 2 =$$

3. Subtract the lower number from the upper:

72	77	63	70	79
48	59	17	25	39
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>

4. Copy, and fill the blanks:

$$16 \times 4 = \quad 14 \times 5 =$$

$$18 \times 3 = \quad 13 \times 6 =$$

$$19 \times 4 = \quad 11 \times 7 =$$

$$39 \times 2 = \quad 16 \times 5 =$$

## THE NUMBERS EIGHTY TO ONE HUNDRED.

## CLASS WORK.

1. Eighty = how many 10's?  
Eighty = how many dozens?  
Eighty = how many score?
2. How many squares can be made with 80 sticks?
3. Eight tens are how many more than 5 tens?
4. Seven dozen are how many more than 4 score?
5. Take 80 steps. Measure the distance.
6.  $\frac{1}{2}$  of 80 = how many more than  $\frac{1}{3}$  of 90?
7. What three numbers multiplied together make 84?
8. How many prime numbers between 80 and 90? How many composite numbers?
9. What is the largest number that will exactly divide 80 and 88?
10. Write all the numbers that will exactly divide both 60 and 80.
11. What is the largest number that will exactly divide 60 and 80? The largest that will exactly divide 64 and 80?

*Make up other exercises.*

## SEAT WORK.

1. Write all the prime numbers from 1 to 89.
2. Write all the composite numbers between 1 and 89.
3. Write the prime factors of each of the following composite numbers.

81	84	86	88
82	85	87	90

*NOTE. They should be written in this manner:*

$$81 = 3 \times 3 \times 3 \times 3.$$

$$90 = 2 \times 3 \times 3 \times 5.$$

4. Write all the divisors of each of the following numbers:

81	84	85	88	90
----	----	----	----	----

5. Copy, and fill the blanks:

$$\frac{1}{2} \text{ of } 80 =$$

$$\frac{1}{4} \text{ of } 80 =$$

$$\frac{1}{8} \text{ of } 80 =$$

$$\frac{1}{16} \text{ of } 80 =$$

$$\frac{1}{32} \text{ of } 80 =$$

$$\frac{1}{64} \text{ of } 80 =$$

6. Write answers to the following:

$$3 \times 3 \times 3 \times 3 =$$

$$4 \times 5 \times 2 \times 2 =$$

$$2 \times 41 =$$

$$5 \times 17 =$$

## CLASS WORK.

1. What 3 pieces of money together make 80 cents?

2. What is the smallest number of pieces which together make 90 cents? Name them.

3. How many dimes in 90 cents? How many dimes in 1 dollar?

4. Ninety cents = how much less than 1 dollar?

5. What is the smallest number of bills which together make \$86? Name them.

6. Divide \$90 equally among 6 men.

7. If 6 men earn \$90 in 3 days, how much do they earn in 1 day? How much does each earn in 3 days? How much in 1 day?

8. How many minutes in 1 hour? in  $1\frac{1}{2}$  hours? in  $1\frac{1}{4}$  hours?

9. Name three months which together make 90 days?

10. How many days in the Spring months? in the Winter months?

*Increase the number of these exercises.*

## SEAT WORK.

1. Copy, and fill the blanks:

$$80 = (3 \times 25) +$$

$$90 = (3 \times 25) +$$

$$85 = 5 \times$$

$$87 = 3 \times$$

$$88 = 4 \times 11 \times$$

$$84 = 3 \times 4 \times$$

$$82 = 2 \times$$

$$90 \div 6 =$$

$$5 \times 15 =$$

$$6 \times 15 =$$

$$50 + 25 + = 86.$$

$$\frac{1}{2} \text{ of } 90 =$$

$$\frac{1}{2} \text{ of } 90 = \frac{1}{2} \text{ of}$$

$$\frac{1}{2} \text{ of } 90 = \frac{1}{2} \text{ of}$$

$$\frac{1}{2} \text{ of } 80 = \frac{1}{2} \text{ of}$$

$$\frac{1}{2} \text{ of } 84 = \frac{1}{2} \text{ of}$$

$$\frac{1}{2} \text{ of } 85 = \frac{1}{2} \text{ of}$$

2. Copy, and remember :

$$7 \times 4 = 28.$$

$$7 \times 5 = 35.$$

$$7 \times 6 = 42.$$

$$7 \times 7 = 49.$$

$$7 \times 8 = 56.$$

$$7 \times 9 = 63.$$

$$7 \times 10 = 70.$$

$$7 \times 11 = 77.$$

$$7 \times 12 = 84.$$

$$7 \times 13 = 91.$$



## CLASS WORK.

1. How many rods in  $\frac{1}{4}$  of a mile?

2. Measure and mark the boundaries of a plot of ground 10 rods long and 8 rods wide.

3. Draw a rectangle 10 inches long and 8 inches wide.

4. How many square inches in the rectangle? How many square rods in the plot of ground measured?

A square rod is often called a perch.

Forty square rods = one rood.

Write this:

40 perches = 1 rood.

5. How many roods in the plot of ground measured?

6. Measure the length and width, in rods, of the playground.

7. How many square rods does the playground contain? How many roods?

8. Draw a map of the playground, making one inch represent a rod. How many square inches does the map contain?

*Give other exercises in measuring small plots of land.*

## SEAT WORK.

1. Commit to memory:

$$8 \times 10 = 80.$$

$$8 \times 11 = 88.$$

$$8 \times 12 = 96.$$

$$9 \times 9 = 81.$$

$$9 \times 10 = 90.$$

$$9 \times 11 = 99.$$

$$10 \times 8 = 80.$$

$$10 \times 9 = 90.$$

$$11 \times 8 = 88.$$

2. Review, and commit to memory:

$$2^2 = 4.$$

$$3^2 = 9.$$

$$4^2 = 16.$$

$$5^2 = 25.$$

$$6^2 = 36.$$

$$7^2 = 49.$$

$$8^2 = 64.$$

$$9^2 = 81.$$

3. Draw squares to illustrate each of the above.

4. How much larger is a square 9-inches than a square 8-inches?  $9 + 8 = ?$

5. How much larger is a square 7-inches than a square 6-inches?  $7 + 6 = ?$

## CLASS WORK.

1. Here is a board 1 foot wide and 12 feet long. What is its area?

2. If it were only half as wide, what would be its area?

3. If it were twice as long?

4. If it were 24 feet long and 3 inches wide? What is the area of ten such boards?

*NOTE.* If a board is only 1 inch thick, its "measure" is the same as the area of one side. If it is more than 1 inch thick, multiply the area of one side by the thickness in inches, in order to obtain its "measure."

5. Here is a board 16 feet long, 6 inches wide, and 2 inches thick. What is its measure?

6. Here is a door 3 ft. wide and 6 ft. high. How many feet of plank 1 inch thick will be required to make it?

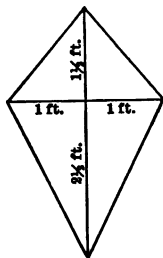
7. Measure the door in the school-room, and find how many feet of plank were required to make it, allowing the plank to be 1 inch thick.

*Give as much practical work of this kind as possible.*

## SEAT WORK.

1. Here are six blocks of wood. Find the measure of each, according to the rules for board measure?

*TO THE TEACHER.* These blocks may be simply pieces of planks, and should be small enough to allow of measurement at the desks of pupils. They should be either 1 in. or  $\frac{1}{2}$  in. thick, and of different lengths and widths.



2. William's kite is of the dimensions indicated by the figures in this diagram. How many square feet of paper will cover it? What is the length of the two sticks forming its framework?

3. Make a larger diagram in which 1 inch represents a foot. What is the distance around the edge of the kite?

*Continue the practice of buying, selling, writing bills and settlements, keeping accounts, and making change.*

*Let the operations include dollars and cents taken together. Of course the pupils have long ago discovered that 100 cents = 1 dollar.*

*Review as frequently as possible the operations and principles taught in former lessons.*

*As far as practicable let each operation be illustrated by some actual performance in buying, selling, or measuring. The measuring and weighing of objects should be kept up in connection with almost every lesson.*

### ONE WAY TO KEEP AN ACCOUNT.

#### ALICE FORD'S GENERAL ACCOUNT BOOK.

Date.		Rec'd. Expended.			
1891					
May 1	Cash on hand - - - - -	1	15		
" 4	Bought a book for - - - - 30 cts.				
	" a pencil for - - - - 4 "				
	" a spool of thread for - - 9 "				43
" 10	Spent at the May party - - - - -				30
" 12	Rec'd for helping mother - - - - -		25		
" 16	Bought 1 doz. oranges, at 5 cts. each - - -				60
" 17	Spent for candy - - - - -				05
" 20	Sold 5 qt. strawberries, at 15 cts. a qt. - -		75		
" 25	Bought 3 papers of pins, at 7 cts. a paper -				21
" 30	Sold 2 papers of pins, at 10 cts. a paper -		20		
		2	35	1	59
" 31	Balance (on hand at end of the month) - -				76

## CLASS WORK.

1. Draw a square nine-inches.
2. Divide it into square inches.
3. What is the square of 9?
4. Draw a square ten-inches. Find the square of ten.

5. How many more square inches in a square ten-inches than in a square nine-inches?

6. Draw an oblong 20 inches long which shall contain 100 square inches.

7. A room is 9 feet wide and 10 feet long. (Represent it by a diagram.) What is its area?

8. What is its area in square yards?

9. A field is 8 rods wide and 12 rods long. Draw a diagram to represent it, on the scale of 1 inch to a rod. What is the area of the diagram? What is the area of the field?

10. Another field of the same area is 16 rods long. Draw a diagram to represent it, and find its width.

11. How many rods of fence would be required to enclose each field?

## SEAT WORK.

1. Write all the prime numbers from 1 to 97.

2. Write all the composite numbers between 90 and 100.

3. Write the prime factors of each of the following numbers :

$$91 = \quad 94 = \quad 98 =$$

$$92 = \quad 95 = \quad 99 =$$

$$93 = \quad 96 = \quad 100 =$$

4. What is the largest number that will exactly divide 72 and 96?

5. What are the prime factors of 72? What are the prime factors of 96?

6. What prime factors of 72 are also prime factors of 96? Multiply these common prime factors together.

7. Copy, and remember :

$$9 \times 3 = 27.$$

$$9 \times 4 = 36.$$

$$9 \times 5 = 45.$$

$$9 \times 6 = 54.$$

$$9 \times 7 = 63.$$

$$9 \times 8 = 72.$$

$$9 \times 9 = 81.$$

$$9 \times 10 = 90.$$

$$9 \times 11 = 99.$$

## CLASS WORK.

1. How many yards in 90 feet? in 96 feet?

2. How many feet in 27 yd.?

3. How many feet in 6 rods?  
How many yards?

4. Measure 33 yd. down the street. How many feet?

5. Measure in the same direction 6 rods. How many feet?

*Give much additional practice in measuring.*

6. If you are just 8 yr. old, how many months have you lived?

7. 96 hr. = how many days?

8. How many days in the three summer months? in the three winter months?

9. How many minutes in 1½ hours? in 1½ hours?

10. How many weeks in 95 school-days?

11. How many days in 14 full weeks? How many working-days in 14 weeks?

12. How many hours from 6 o'clock Sunday morning to 12 o'clock, noon, Wednesday?

*Ask many other questions.*

## SEAT WORK.

1. Copy, and fill the blanks:

99 in. = ft. in.

99 ft. = yd.

99 ft. = rd.

96 pt. = qt.

96 pt. = gal.

96 gal. = bbl. gal.

96 qt. = pk.

96 qt. = bu.

96 oz. = lb.

2. Write all the numbers below 100 which are exactly divisible by 4; by 5; by 6; by 7; by 8; by 9; by 10; by 11; by 15; by 20; by 24; etc.

3. Add these columns:

12	18	15	19	14
16	17	33	29	14
20	25	9	13	16
19	14	17	6	26
13	12	24	8	26

4. Subtract:

93	98	91	95	97
16	19	79	82	17

5. Multiply:

16	19	24	17	13
6	5	4	5	7

## CLASS WORK.

1. How many ounces in 5 lbs? in 6 lbs.?

2. What cost 3 lbs. of spices at 2 cts. an ounce?

3. If 15 lbs. of rice cost 90 cts., what costs 1 lb.?

4. One bushel of wheat weighs 60 lbs. What is the weight of  $1\frac{1}{2}$  bu.?

5. A bushel of corn weighs 56 lbs. What is the weight of a peck? of a half-peck? of a quart?

Weigh a quart of corn, and see how nearly correct this is.

6. How much heavier is a quart of wheat than a quart of corn?

7. Weigh a quart of beans; of rice; of sand.

8. Which is heavier, 5 lbs. of beans or 80 oz. of sand?

9. If an ounce of cinnamon costs 5 cents, what will 1 lb. cost? What will 1 lb. 3 oz. cost?

10. If a bushel of wheat costs 90 cents, what is 1 lb. worth?

*Give other practical exercises in weighing.*

## SEAT WORK.

1. Write five questions similar to those in the other column, and give answers to the same.

2. Sell five articles of farm produce, and make out a bill in good form.

3. Make a table of the weights of different substances, taking 1 quart as the measure of each, as below:

1 qt. of wheat = lbs. oz.

1 pk. of wheat = lbs. oz.

1 bu. of wheat = lbs.

1 qt. of corn = lbs. oz.

1 pk. of corn = lbs. oz.

1 bu. of corn = lbs.

1 qt. of beans = lbs. oz.

1 pk. of beans = lbs. oz.

1 bu. of beans = lbs. oz.

4. 6 lbs. = oz.

23 gal. = qt.

24 bu. = pk.

3 bbl. = gal.

92 pk. = bu.

4 da. = hr.

14 wk. = da.

46 qt. = pt.

32 yd. = ft.

8 ft. = in.

6 rd. = ft.

Review all the principles and facts learned in this Step.

Write all the even numbers to 100.

Write all the odd numbers to 100.

Write all the prime numbers to 100.

Write all the composite numbers to 100. Write the prime factors of each.

Write all the numbers that are divisible by 4; by 5; by 6; by 7; by 8; by 9; by 10; by 11; by 12.

How many score make 100?

How many dozen make 100?

Write the squares of all the numbers from 1 to 10.

The square of what number is equal to 100?

How many pounds in 96 ounces? in 100 ounces?

Give the dimensions of a box that will contain 100 cubic inches.

$2 \times 2 \times 2 =$  how many?  $2^3 =$  how many?

$3 \times 3 \times 3 =$  how many?  $3^3 =$  how many?

$4 \times 4 \times 4 =$  how many?  $4^3 =$  how many?

How many days in 96 hours? in 100 hours?

How many dimes = \$1? How many cents = \$1?

How many cents in  $\frac{1}{2}$  dollar? in  $\frac{1}{4}$  dollar? in  $\frac{1}{10}$ ?

How many gallons in a barrel? in 2 barrels? in 3 barrels?

How many feet in a rod? in 2 rods? in 3 rods?

How many rods in 33 feet? in 66 feet? in 99 feet?

Make out a bill of seven articles purchased at a dry-goods store and paid for.

How many five-dollar bills make \$100?

What three pieces of money = 85 cents?

What is the smallest number of pieces of money necessary to make 96 cents?

How many months in 100 days?

How many days in the spring months? in the fall months?

What is a cube? a cubical body? Name examples of each.  
Find the capacity of a cubical box  $6 \times 8 \times 2$  inches.

Write 5 pairs of even numbers, the sum of each pair being equal to 100.

Write five pairs of odd numbers, the sum of each pair being equal to 100.

How many rods = 1 chain?

What is the largest number that will exactly divide 75 and 100?

What is the largest number that will exactly divide 72 and 96?

---

OTHER THINGS TO BE LEARNED BEFORE ADVANCING  
TO THE NEXT STEP.

1. *How to read numbers to 10,000.*
2. *How to write numbers to 10,000.*
3. *The Roman notation to C.*
4. *How to add columns of two figures rapidly and accurately, the sum not to exceed 1000.*
5. *How to multiply any two numbers together, the multiplier being a single figure, and the multiplicand not greater than 99.*
6. *The multiplication table to  $12 \times 12$ . This should be thoroughly memorized.*



# THE INDUSTRIAL ARITHMETIC.



*STEP THE FIFTH.*

TO TEN THOUSAND.



## STEP THE FIFTH.



### TO THE TEACHER.

Before beginning this Step, review the leading principles taught in the earlier Steps. Be sure that the pupil understands thoroughly, and is able to apply practically every new principle learned. Lead him still to make discoveries for himself.

In the processes of addition and multiplication, it is not yet necessary for the child to be able to tell why "we carry 1 for every 10"; nor is it necessary to explain the so-called method of "borrowing" in subtraction. If the pupil is rightly taught, he will discover the reason of these operations for himself, and in good time will be able to make satisfactory explanations. For the present, teach **HOW** to do the work; the **WHY** will come later.

Beware of long analyses. Follow no established forms; but let all explanations be brief, well understood, and sensible, using no more words than are necessary to convey the meaning. . . . But continue the thorough memorizing of the "tables," as in the earlier Steps, and do not yet abandon the constant daily practice of *adding at sight*. Be sure that every pupil is a **GOOD ADDER**.

The objects needed for illustration in this Step will suggest themselves. Definitions might be occasionally introduced, but never unless required for a clearer understanding of the text.

Continue, patiently and carefully, the practical work of measuring and weighing; of making purchases, selling, and making

change; of writing bills of sales. The examples given in the following pages are only suggestive of scores of others which it is expected the teacher will make up and present to the class.

VERY FREQUENT REVIEWS are necessary during the progress of the work in this Step. Many review lessons are indicated in the following pages; the teacher should increase the number, if there should appear to be any lack of thoroughness on the part of the pupils.

It will be observed that some exercises, as well as some examples, are repeated. It is only by constant repetition that many pupils finally become able to solve a problem readily or to understand a principle clearly.

Make haste slowly.

## TO TEN THOUSAND.

## CLASS WORK.

*Teach how to write numbers to 10,000.*

*Explain carefully the use of the cipher in filling vacant places.*

*Teach the names of the orders, units, tens, hundreds, thousands.*

*Lead the pupils to discover that ten of one order make one of the next higher order.*

How many 10's in 100? in 200? in 500? in 1000?

How many ciphers in the number 10? How many in the number 100? in the number 1000?

One hundred is how many times 10? One thousand is how many times 100?

How many ciphers in the number 500? in the number 50?

What is  $\frac{1}{10}$  of 100? of 500? of 800? of 5000?

7777

What is the value of the first figure 7 (at the right hand)? What is the value of the second? of the third? of the fourth?

## SEAT WORK.

Write the following numbers in figures :

One hundred ten.

One thousand ten.

Five hundred fifty.

Five thousand fifty.

Two hundred eighty-five.

Two thousand eight hundred fifty.

Six hundred sixty-six.

Six thousand six hundred sixty-six.

Eight thousand eight.

Eight hundred eight.

Nine thousand eight hundred seventy-six.

Six hundred.

Six thousand.

Nine thousand ninety.

Seven thousand seven hundred seventy-seven.

Three thousand six hundred.

Four thousand seven hundred one.

Five thousand eight hundred ten.

Six thousand nine hundred twenty-one.

Seven thousand two hundred.

## CLASS WORK.

*See that the processes involved in each example are thoroughly mastered and understood.*

1. If you learn 10 words a day, how many days will be required to learn 100 words? 1000 words? 50 words? 500 words? 5000 words?

2. A man having \$1000 lost \$10 of it. How much was left?

3. If he had lost  $\frac{1}{10}$  of all that he had, how much would have been left?

4. How many horses at \$100 each can be bought for \$100? for \$1000? for \$10,000?

5. If I earn \$1000 a year, how much will I earn in 5 years? in 10 years?

6. If John Jones paid \$800 for 80 acres of land, how much did he pay per acre?

7. If he sold half his farm for \$20 an acre, how much did he gain in his trade?

8. At \$25 each, how many cattle can be bought for \$100? for \$1000? for \$10,000?

*Make up other examples similar to these.*

## SEAT WORK.

1. Add :

			503	411
202	320	210	231	322
120	132	314	420	210
333	413	104	513	112
<u>513</u>	<u>314</u>	<u>311</u>	<u>632</u>	<u>233</u>

2. Multiply :

202 by 4.	314 by 2.
120 by 4.	411 by 5.
333 by 3.	322 by 4.
320 by 4.	210 by 8.
413 by 3.	112 by 4.

3. Write all the prime numbers between 100 and 200.

4. Write the divisors of 110, 125, 140, 144.

5.	$4 \times 25 =$
	$5 \times 25 =$
	$6 \times 25 =$
	$7 \times 25 =$
	$8 \times 25 =$
	$200 \div 8 =$
	$100 \div 4 =$
	$225 \div = 25.$

6.	$7 = 7 \times$
	$70 = 7 \times$
	$700 = 7 \times$
	$7000 = 7 \times$
	<u><math>7777 = 7 \times</math></u>

## CLASS WORK.

*See Lesson XX., Step Fourth.*

If the sum of a column is 10, or more than 10, the left-hand figure of that sum, instead of being written down, is added to the next column. . . . But when the column added is the last to the left, the entire sum is written down.

*Give original examples for practice.*

*Make up practical examples, as in the buying or selling of many articles of different kinds.*

*Insist upon absolute accuracy.*

1. Mr. Bell gave \$410 for one town lot, \$354 for another, \$123 for another, and \$305 for another. How much did he give for the four lots?

2. Seven men were at work in a mill. The first earned \$4.34, the second \$3.17, the third \$5.51, the fourth \$12.85, the fifth \$2.43, the sixth \$63.85, and the seventh \$8.04. How much did all earn?

3. Find the sum of \$19.80, \$3.20, \$7.19, \$12.34, \$16.00, \$31.77, \$123, \$65.91.

## SEAT WORK.

1. Add:

410	134	520	341	150
354	310	314	210	405
123	545	415	354	361
<u>305</u>	<u>108</u>	<u>249</u>	<u>442</u>	<u>523</u>

3210	817
1332	212
223	391
321	526
233	315
221	212
322	617
313	122
217	171
<u>131</u>	<u>415</u>

\$4.34	\$412.90
3.17	13.50
5.51	.43
12.85	1.12½
2.43	75.16
63.85	95.15
<u>8.04</u>	<u>14.86</u>

2. Mr. Kay bought 4 barrels of cider from one man, and 29 gallons from another. How many gallons did he buy of the two men?

3. What was its cost, at 12 cents a gallon? How much did he pay each man?

## CLASS WORK.

## Oral Review.

1. How many days in 12 weeks?

2. If I earn \$3 a day for every working day in March, how much do I earn?

3. In 3 weeks and 6 days, how many days?

4. If John earns 8 cts. every day for two weeks, how much does he earn all together?

5. What will 1 gallon of milk cost at 7 cents a pint?

6. If  $\frac{1}{2}$  lb. of coffee cost 13 cents, what will 3 lbs. cost?

7. Buy 29 yards of silk at \$3 a yard.

8. Give 18 five-dollar bills in payment. How much change is due you?

*Make up other questions similar to these.*

9. How many eggs in 10 dozen?

10. How many score = 10 dozen?

11. If you take 10 steps in walking a rod, how many steps will you take in walking 20 rods? 40 rods?

## SEAT WORK.

1. Multiply:

$$514 \text{ by } 2.$$

$$623 \text{ by } 3.$$

$$743 \text{ by } 2.$$

$$23 \times 3 =$$

$$123 \times 5 =$$

$$23 \times 4 =$$

$$241 \times 4 =$$

$$14 \times 4 =$$

$$612 \times 7 =$$

$$16 \times 3 =$$

$$735 \times 4 =$$

$$19 \times 2 =$$

$$292 \times 8 =$$

$$24 \times 4 =$$

$$317 \times 3 =$$

$$53 \times 5 =$$

$$1224 \times 3 =$$

$$1414 \times 4 =$$

$$1342 \times 5 =$$

$$1134 \times 6 =$$

$$1332 \times 5 =$$

$$1443 \times 5 =$$

$$1324 \times 4 =$$

$$1417 \times 3 =$$

$$1623 \times 4 =$$

2. Fill the blanks below:

$$2 \times 2 = 2^2 =$$

$$6 \times 6 = 6^2 =$$

$$3 \times 3 = 3^2 =$$

$$7 \times 7 = 7^2 =$$

$$4 \times 4 = 4^2 =$$

$$8 \times 8 = 8^2 =$$

$$5 \times 5 = 5^2 =$$

$$9 \times 9 = 9^2 =$$

3. Draw a triangle of any convenient size. Now draw a rectangle whose area is double that of the triangle.



## CLASS WORK.

1. John buys one pencil for 2 cents, and another for 4 cents. How much does he give for both?

2. If 2 pencils cost 6 cents, what is the cost of 1 pencil?

3. We say that the *average* price which John pays for his two pencils is 3 cents.

4. Mr. White bought one cow for 20 dollars, and another for 40 dollars. How much did he pay for both? What was the average cost of the two cows?

5. William buys 3 oranges at 5 cents each, and 2 oranges at 10 cents each. How many oranges did he buy? What was the entire cost? What was the average cost per orange?

6. Frank has 3 sticks: the first is 4 inches long, the second is 5 inches long, the third is 9 inches long. What is the average length of the sticks?

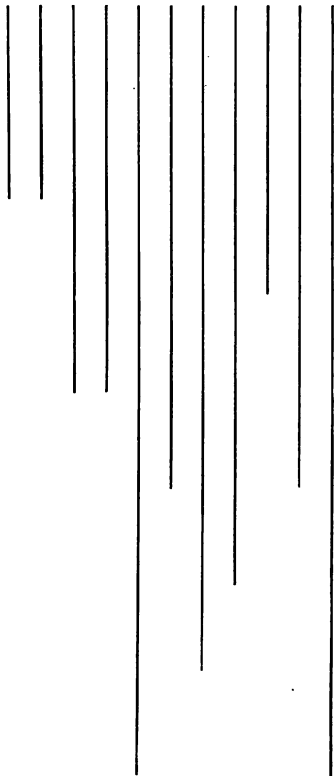
7. Helen attended school 5 days the first week, 3 days the second week, 1 day the third week, and 3 days the fourth. What was the average number of days she attended per week?

## SEAT WORK.

1. Find the length of each of these lines.

2. Find the sum of their lengths.

3. Find their average length.



4. Draw 11 lines all of the same length, but the sum of whose lengths shall be the same as that of these lines.

## CLASS WORK.

1. Bought 3 pecks of apples at 30 cents a peck, and sold them at 35 cents a peck. How much was gained?

2. Bought a bushel of apples for \$1.00, and sold them at 30 cents a peck. How much was gained?

3. Bought 10 bushels of apples at \$1.00 a bushel, and sold them at 30 cents a peck. How much was gained?

4. Bought 3 pecks of apples at 33 cents a peck, and gave a 2-dollar bill in payment. How much change should be received?

5. Bought 5 bushels of potatoes at 40 cents a bushel, and 6 pecks of apples at \$1.00 a bushel. Find the whole cost.

6. A farmer gathered 7 bushels of apples off of each of 13 trees, and 9 bushels off of another tree. How many bushels?

7. He sold  $\frac{1}{2}$  of these apples to Mr. Brown, made cider of 26 bushels, and stored the remainder in his cellar. How many bushels did he sell, and how many did he put in the cellar?

## SEAT WORK.

Copy, and fill the blanks:

March has . . . days.

April has . . . days.

May has . . . days.

There are . . . days in the Spring months.

June has . . . days.

July has . . . days.

August has . . . days.

There are . . . days in the Summer months.

September has . . . days.

October has . . . days.

November has . . . days.

There are . . . days in the Fall months.

December has . . . days.

January has . . . days.

February has . . . days.

There are . . . days in the Winter months.

The Spring months have . . . days.

The Summer months have . . . days.

The Fall months have . . . days.

The Winter months have . . . days.

In one year there are . . . days.

## CLASS WORK.

## Oral Review.

1. How many fingers have ten boys?

2. How many ounces in 2 lbs.? in  $2\frac{1}{2}$  lbs.? in 5 lbs.?

3. Name the prime factors of 95; of 78; of 18; of 49; of 91.

4. Name all the prime numbers below 100.

5. What is the largest divisor common to 60, 78, and 96?

6.  $\frac{1}{2}$  of 100 = what?

$\frac{2}{3}$  of 100 = what?

$\frac{1}{4}$  of 100 = what?

$\frac{3}{4}$  of 100 = what?

7. What is the difference between  $\frac{1}{2}$  of 100 and  $\frac{1}{4}$  of 100? Between  $\frac{2}{3}$  of 100 and  $\frac{1}{3}$  of 100?

8. What is  $\frac{1}{16}$  of 100?

9. How many feet in 5 rods?

10. What is the area of a field 8 rods by 15 rods?

*Make up many other questions similar to these.*

11. What two numbers multiplied together make 160? Mark the boundaries, in any convenient place, of a plot of ground containing 160 square rods.

## SEAT WORK.

1. Write the names of the months, and the number of days in each.

2. How many days in the Spring months? in the Summer months? in the Autumn months? in the Winter months?

Write the answers to the following questions:

3. How many days in a year?

4. How many weeks in a year?

5. If you are just 10 years old, how many months have you lived?

6. How many weeks?

7. How many weeks in 2 years? in 5 years?

8. How many months in 12 years?

9. How many days in 2 years?

10. How many days in  $\frac{1}{2}$  year? in  $\frac{1}{4}$  year?

11. How many days in July and August?

12. How many working days in 25 weeks?

13. 4 mo. = da.

6 mo. = da.

## CLASS WORK.

*Review the principle already learned (Step Fourth, page 189), of subtracting when the lower figure is sometimes larger than the upper.*

*The pupils have already been taught to add 10 to the minuend figure, and 1 to the next higher subtrahend figure.*

*Give examples for practice.*

## Definitions.

The larger number in subtraction is called the *minuend*.

The smaller number in subtraction is called the *subtrahend*.

The result obtained by subtracting one number from another is called the *remainder*.

*Make up some review questions in averages. See page 225.*

1. The minuend is 6291; the subtrahend is 4182. What is the remainder?

2.        18 — 9 =  
           180 — 90 =  
           180 — 99 =  
           1800 — 900 =  
           1800 — 99 =  
           1800 — 999 =

## SEAT WORK.

$$\begin{aligned} 5043 - 1310 &= \\ 3545 - 1326 &= \\ 4036 - 3139 &= \\ 5256 - 5175 &= \\ 3251 - 1371 &= \\ 1736 - 1245 &= \\ 8213 - 7312 &= \\ 5627 - 4738 &= \\ 6322 - 5876 &= \\ 2102 - 1999 &= \end{aligned}$$

$$\begin{aligned} \frac{1}{4} \text{ of } 100 &= \\ \frac{1}{4} \text{ of } 400 &= \\ \frac{1}{4} \text{ of } 1000 &= \\ \frac{1}{4} \text{ of } 4000 &= \end{aligned}$$

$$\begin{aligned} 10 \times 10 &= 10^2 = \\ 11 \times 11 &= 11^2 = \\ 12 \times 12 &= 12^2 = \\ 13 \times 13 &= 13^2 = \\ 14 \times 14 &= 14^2 = \\ 15 \times 15 &= 15^2 = \\ 16 \times 16 &= 16^2 = \\ 17 \times 17 &= 17^2 = \end{aligned}$$

$$\begin{aligned} 16^2 - 15^2 &= \\ 15^2 - 14^2 &= \\ 14^2 - 13^2 &= \\ 13^2 - 12^2 &= \\ 12^2 - 11^2 &= \\ 11^2 - 10^2 &= \end{aligned}$$

## CLASS WORK.

1. How many years since 1850?

2. How many years since 1876?

3. Columbus discovered America in 1492. How long ago was that?

4. Mr. Johnson was born in 1860. How old is he?

5. In 17 years from now what year will it be?

6. How many years is it till 1925?

7. How many years is it till the year 2000?

8. Write this:

One hundred years = one century.

9. How many months in a century?

10. How many weeks in 14 days? in 28 days? in 140 days? in 365 days?

11. How many weeks in a year? in 10 years? in 50 years?

12. How many weeks in a century?

*Make up many other questions like these. Let the children ask still others.*

## SEAT WORK.

Write answers to these questions:

1. How many days in 6 weeks? in 6 months?

2. If I earn \$3 a day for every working day in April and May, how much do I earn?

3. In 5 months and 5 days how many days?

4. If you earn 12 cents a day every day for 3 months, how much do you earn in that time?

5. How many days in each month of the year? in the whole year?

6. In every fourth year February has 29 days. We call such a year *leap-year*. How many days in a leap-year?

7. Work this out:

1st year has 365 days.

2nd year has 365 days.

3rd year has 365 days.

4th year has 366 days.

In four consecutive years there are days.

The average number of days in a year =

8. How many days in 5 consecutive years?

## CLASS WORK.

1. Draw a square foot.
2. Divide it into square inches.
3. How many square inches = 1 sq. ft.? Write it.
4.  $12^2$  = how many?
5. Draw a square half-foot.
6. Divide it into square inches. How many?
7.  $36$  = what part of  $144$ ?
8. Draw a square yard.
9. Draw a square 5-yards. Draw a square  $5\frac{1}{2}$ -yards. How many square yards in a square 5-yards? in a square  $5\frac{1}{2}$ -yards?
10. Draw a square rod.
11. Divide it into square yards. How many?
12. Measure the school-yard, giving length and breadth in rods. What is its area in square rods?
13. Learn this :  
 $160$  sq. rd. = 1 acre,  
 or  $160$  perches = 1 acre.
14. How many square rods in  $\frac{1}{4}$  acre? in  $\frac{1}{2}$  acre? in  $\frac{1}{16}$  acre?
15. Mark the boundaries of a plot of ground containing 1 acre.

## SEAT WORK.

1. Write this :  
 $144$  sq. in. = 1 sq. ft.
2. Copy, and fill the blanks :  
 $9^2 =$      $10^2 =$      $11^2 =$      $12^2 =$   
 $\frac{1}{4}$  of  $144 =$   
 $1$  sq. ft. = sq. in.  
 $1$  sq.  $\frac{1}{2}$  ft. = inches square.  
 $1$  sq.  $\frac{1}{4}$  ft. = sq. in.  
 $2$  sq. ft. = sq. in.  
 $9$  sq. ft. = sq. yd.  
 $1$  sq. yd. = sq. in.
3. Copy, and fill the blanks :  
 $\text{yd.} = 1 \text{ rod.}$   
 $30\frac{1}{2}$  sq. yd. =  
 $(5\frac{1}{2})^2 = 30\frac{1}{2}$ .  
 $160$  sq. rd. =  
 $\frac{1}{2}$  acre = sq. rd.  
 $\frac{1}{4}$  acre = sq. rd.  
 $10$  acres = sq. rd.  
 $40 \times 40 =$
4. Draw a diagram representing a field containing 1 acre. (Let 1 inch represent 10 rods.)
5. Draw, in the same way, a diagram representing a square field of 10 acres.
6. Divide this 10-acre field into 10 smaller fields (not square) each containing 1 acre.

## CLASS WORK.

1. Is there an acre of land in the school-yard?

2. How many square rods does it lack? Or how many square rods more than an acre does it contain?

3. Measure a plot of ground 32 rods long and 10 rods wide.

4. How many square rods does it contain? How many acres?

5. If a plot of ground cannot be had to measure, measure in the street a space 80 rd. long and 2 rd. wide. What is its area?

6. How many rods in 1 chain. Eighty rods = how many chains?

320 rods = 1 mile.

$\frac{1}{4}$  of a mile = how many rods? how many chains?

How many chains in a mile?

7. How many square rods (or perches) = 1 rood?

40 sq. rd. = what part of an acre?

How many roods = 1 acre?

1 rood = what part of an acre?

12 roods = how many acres?

## SEAT WORK.

$$6243 - 3042 =$$

$$5312 - 1201 =$$

$$4261 - 2140 =$$

$$5342 - 1310 =$$

$$9876 - 7654 =$$

$$3927 - 2521 =$$

$$4546 - 2526 =$$

$$7884 - 3621 =$$

$$9846 - 1845 =$$

$$43 - 8 =$$

$$143 - 8 =$$

$$43 - 18 =$$

$$143 - 18 =$$

$$143 - 118 =$$

$$1143 - 118 =$$

$$50 - 25 =$$

$$150 - 125 =$$

$$1150 - 1125 =$$

$$140 - 40 =$$

$$140 - 45 =$$

$$140 - 55 =$$

$$75 - 25 =$$

$$75 - 28 =$$

$$175 - 28 =$$

$$1175 - 28 =$$

$$175 - 128 =$$

$$1175 - 128 =$$

$$1891 - 72 =$$

$$1900 - 91 =$$

$$1900 - 1891 =$$

## CLASS WORK.

## Oral Review.

1. In 29 pints how many quarts?
2. What cost 6 quarts of milk at 8 cents a pint?
3. How many quarts in a bushel? in 10 bushels?
4. How many pints in a half-bushel? in a peck?
5. 100 qt. = how many gallons? how many pints?
6. How many gallons in a barrel? in 2 barrels? in 3 barrels?
7. How many pecks in 25 bushels? in 250 bushels?
8. What costs a barrel of cider at 10 cents a gallon?
9. Bought a barrel of cider at 10 cents a gallon, and sold it at 5 cents a quart. How much was gained?
10. If 2 barrels make a hogshead, how many gallons in a hogshead? How many quarts in a hogshead?
11. How many pints in a barrel?

*Make up other questions similar to these.*

## SEAT WORK.

## Questions for Solution.

Write the answers to all these questions:

1. A man having 415 sheep, sold 273 of them? How many had he left?
2. Mr. Smith had \$345.75 in the bank. He drew out \$252.50. How much was left?
3. Harry earns \$18.75. He spends \$14.25 for clothes, and \$2.20 for books. How much has he left?
4. How many square rods in 4 acres?
5. How many square rods in  $\frac{1}{2}$  acre?
6. A man buys a pair of horses for \$325. He sells one of them for \$210.50, and the other for \$175. How much does he gain?
7. Mr. Jones sold four fields; the first for \$986, the second for \$1124, the third for \$1796, the fourth for \$412. How much did he get for all?
8. Mr. Brown bought 80 acres of land at \$25 an acre. What was the whole cost?



## CLASS WORK.

1. What is the area of a garden-bed 30 ft. long and 3 ft. wide?

2. What is its area in square yards?

3. How many square feet in a brick side-walk 100 ft. long and 4 ft. wide?

4. What will it cost to make such a walk, at  $\frac{1}{2}$  dollar a square foot?

5. Buy 12 yards of calico at 12 cents a yard.

6. What six pieces of money, all different, will exactly pay for it?

7. If you give a 2-dollar bill in payment, how much change should you receive?

8. Invest this change in ribbon at 14 cents a yard. How many yards can you buy?

9. Sell the ribbon at 15 cents a yard. How much money have you?

10. What will 9 yards of broadcloth cost at  $\$4\frac{1}{2}$  a yard?

*Make up a large number of practical questions similar to these.*

## SEAT WORK.

Write the answers to the five questions which follow:

1. From \$431.31 take \$127.20.

2. What must be added to \$115.30 to make \$220.60?

3. From the sum of 316,429, 512, and 613 subtract 899.

$$4. \quad 13^2 = \quad 17^2 =$$

$$14^2 = \quad 18^2 =$$

$$15^2 = \quad 19^2 =$$

$$16^2 = \quad 20^2 =$$

$$5. \quad \frac{1}{2} \text{ of } 1 = \quad \frac{1}{2} \text{ of } \frac{1}{4} =$$

$$\frac{1}{2} \text{ of } \frac{1}{2} = \quad \frac{1}{2} \text{ of } \frac{1}{8} =$$

6. Draw a straight line 3 inches long.

7. Draw another straight line of the same length through the middle of the first line and at right angles with it.

8. How many right angles have you made?

9. How many right angles can you draw about any single point?

10. Draw lines joining the ends of the two lines you drew at first. What kind of a figure have you? Measure the distance around it.

## CLASS WORK.

1. How many years in a century?

2. If the first century began with the year 1, with what year did it end?

3. With what year did the 2d century begin? the 3d century? the 4th? the 5th? the 10th? the 14th? the 18th?

4. What century is this?

5. The United States became independent in 1776. How many years have elapsed since?

6. The civil war began in 1861. How long ago was that?

7. How many leap-years in a century?

*NOTE. A year that can be divided by 400 without a remainder is not a leap-year. Every other year that can be divided by 4 without a remainder is a leap-year.*

8. How many leap-years in the 19th century? How many leap-years in the 20th century?

9. To which century will the year 2000 belong? To which century will the year 1899 belong?

## SEAT WORK.

## Review.

1. 99 pints = quarts.

2. Five quarts of milk at 5 cents a pint will cost ... cents.

3. The area of the top of a table 4 feet long by  $2\frac{1}{2}$  feet = sq. ft.

4. The area of a stone sidewalk 3 feet wide and 116 feet long = sq. ft.

5. In 1 bushel are ... quarts.

In  $\frac{1}{2}$  bushel are ... quarts.

In  $\frac{1}{2}$  bushel are ... pints.

6. In 112 quarts there are ... gallons.

In 112 quarts there are ... pecks.

7. In 1 barrel are ... gallons.

In 1 barrel are ... quarts.

In 1 barrel are ... pints.

8. In 1 barrel are ... quarts.

In 1 bushel are ... quarts.

In 1 barrel there are nearly ... bushels.

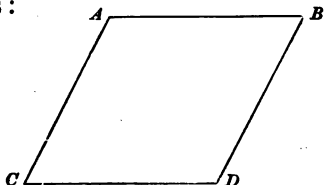
9. At 10 cents a quart, a barrel of cider will cost ...

10. At 40 cents a peck, 4 bushels of apples will cost ...

11. At 10 cents a sq. ft., 3 sq. yds. of carpet will cost ...

## CLASS WORK.

1. Draw a figure with 4 sides, parallel two and two, similar to this:



Let the lines  $AB$  and  $CD$  be 3 inches apart, and 5 inches long. Such a figure is called a parallelogram, because the opposite sides are parallel.

A square, or any other rectangle, is also a parallelogram. To distinguish a figure like this from a rectangle, we call it a **Rhomboid**.

To find the area of a rhomboid, multiply the distance between any two of the parallel lines by the length of one of the same lines.

2. Suppose that two sides of a rhomboid are 10 in. long and 4 in. apart. What is its area?

*NOTE. To find the distance apart, measure always the shortest distance between the lines. This is called Altitude.*

## SEAT WORK.

1. Write these words:

Parallelogram.

Rhomboid.

Altitude.

Square.

Rectangle.

Oblong.

Triangle.

Area.

2. Write what is meant by each of these terms.

3. Draw a rhomboid whose length is 8 inches and altitude 5 inches.

4. What is its area?

5. Divide this rhomboid into two equal triangles.

6. Draw a right triangle whose base is 7 inches and altitude 4 inches.

7. Find its area.

8. Draw another triangle whose base is 5 inches and altitude 5 inches.

9. What is its area?

10. Draw a rhomboid having twice the area of this triangle.

11. Here is a triangular piece of paper. Find its area.

## CLASS WORK.

1. Measure the sidewalk between the front door and (any point named by the teacher).

2. Find the cost of this sidewalk at 50 cents a square foot.

3. Find the area of a rhomboid 10 inches long and having an altitude of 4 inches.

4. Divide it into triangles. What is the area of each triangle?

We are now able to make the following rule.

To find the area of a triangle: Consider one side as the base; measure from the base to the angle opposite for the altitude. Take one-half the number obtained by multiplying the base by the altitude; this is ~~the~~ the area of the triangle. In other words, the area of a triangle = one-half that of a parallelogram having the same base and altitude.

*Illustrate.*

*Let the pupils draw a number of triangles and find their areas. Let them find the areas of triangular pieces of paper of different dimensions.*

## SEAT WORK.

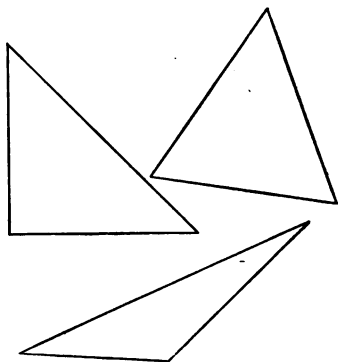
1. Make up and solve three questions in measurements.

2. Three men went fishing. One caught 389 fish, another 1067 fish, and the third 523 fish. How many did all catch?

3. If I pay \$8 a week for board, how much will a year's board cost?

4. One-half of 152 is how much more than  $\frac{1}{3}$  of the same number?

5. Find the area of each of these triangles:



Observe that it does not matter which side of a triangle is considered the base.

6. Copy this:

*Base. Altitude.*

## CLASS WORK.

1. Draw a square foot.
2. Draw a triangle whose area =  $\frac{1}{2}$  square foot.
3. Draw a parallelogram whose area equals that of the triangle.

4. What is the area of a piece of paper 6 in. square?

5. Cut this piece of paper into 4 equal triangles. What is the area of each triangle?

*Give a variety of examples in multiplication in which the multiplier consists of two figures. But it is not necessary yet to explain the process, or to require a minute analysis of the work. It is enough for the present that the pupils know how to perform the required operations.*

$$\begin{array}{r}
 5 \times 4 = \\
 15 \times 4 = \\
 15 \times 14 = \\
 25 \times 14 = \\
 25 \times 24 = \\
 250 \times 24 = \\
 25 \times 240 = \\
 45 \times 240 = \\
 450 \times 24 = \\
 455 \times 24 =
 \end{array}$$

## SEAT WORK.

1. Write the product of :

$$\begin{array}{ll}
 32 \times 5 = & 32 \times 10 = \\
 24 \times 4 = & 24 \times 10 = \\
 45 \times 3 = & 45 \times 20 = \\
 54 \times 2 = & 54 \times 30 = \\
 63 \times 3 = & 63 \times 40 = \\
 123 \times 5 = & 123 \times 40 =
 \end{array}$$

2. Now write the product of :

$$\begin{array}{ll}
 32 \times 15 = & 24 \times 14 = \\
 45 \times 23 = & 54 \times 32 = \\
 63 \times 43 = & 123 \times 45 = \\
 242 \times 53 = & 315 \times 44 = \\
 424 \times 32 = & 219 \times 51 = \\
 551 \times 25 = & 832 \times 15 = \\
 725 \times 26 = & 616 \times 32 = \\
 725 \times 36 = & 616 \times 64 = \\
 725 \times 46 = & 616 \times 96 = \\
 725 \times 56 = & 740 \times 9 = \\
 316 \times 64 = & 740 \times 11 = \\
 316 \times 32 = & 740 \times 99 =
 \end{array}$$

*NOTE. It is better to write the numbers to be multiplied thus :*

$$\begin{array}{r}
 \begin{array}{ccc}
 32 & 45 & 63 \\
 \hline
 15 & 23 & 43 \\
 \hline
 \end{array} \\
 \begin{array}{ccc}
 242 & 424 & 551 \\
 \hline
 53 & 32 & 25 \\
 \hline
 \end{array}
 \end{array}$$

## CLASS WORK.

## Bills.

1. Buy at a grocery :

8 cakes of Soap at 10 cts.

15 lbs. of Coffee at 16 cts.

 $\frac{1}{2}$  lb. of Cheese at 40 cts.

7 doz. Eggs at 30 cts. a doz.

Make out bill.

2. Sell 5 articles from a dry-goods store, and make out a bill in proper form.

3. Sell :

5 gal. Milk at 5 cts. a pint.

4 lbs. Butter at 23 cts.

9 doz. Eggs at 25 cts. a doz.

Make out bill.

4. Sell 12 articles of farm produce, and make out bill.

5. Sell 6 articles from a book and stationery store, and make out bill.

6. Sell :

12 yd. Muslin at 9 cts.

27 yd. Silk at \$1.50.

63 yd. Ribbon at 29 cts.

32 yd. Calico at 8 cts.

8 yd. Broadcloth at \$3.50.

Make out bill.

7. Settle each of the above bills, receipt, and make change, etc.

## SEAT WORK.

$$(\frac{1}{2} \text{ of } 14) \times (\frac{1}{2} \text{ of } 48) =$$

$$(\frac{1}{3} \text{ of } 45) \times (\frac{1}{10} \text{ of } 80) =$$

$$45 \div 9 =$$

$$450 \div 9 =$$

$$270 \div 9 =$$

$$810 \div 9 =$$

$$7200 \div 9 =$$

$$7200 \div 100 =$$

$$7200 \div 900 =$$

$$35 \div 5 =$$

$$350 \div 5 =$$

$$3500 \div 5 =$$

$$49 \div 7 =$$

$$490 \div 70 =$$

$$4900 \div 700 =$$

$$56 \div 8 =$$

$$560 \div 80 =$$

$$5600 \div 800 =$$

$$(\frac{1}{2} \text{ of } 100) \times (\frac{1}{2} \text{ of } 100) =$$

$$(5 \times 20) \div (4 \times 5) =$$

$$(3 \times 15) \div (\frac{1}{2} \text{ of } 18) =$$

$$12^2 - 8^2 =$$

$$(9 \times 6) - 7^2 = 20 -$$

$$(7 \times 9) \div 3 =$$

$$3^2 + 4^2 = \text{square of what number?}$$

$$5^2 = 4^2 +$$

$$6^2 = 5^2 +$$

$$7^2 = 6^2 +$$

$$8^2 = 7^2 +$$

## CLASS WORK.

## Review.

1. One-fourth of 240 is how many more than  $\frac{1}{2}$  of 120?

2. If it is 46 miles to a certain city, how far is it to that city and back?

3. One-half of 30 yards is how many feet?

4. How many hours from the time school opens until it closes?

5. If you go to bed at 9 o'clock and sleep 9 hours, at what time do you rise?

6. If you sleep 9 hours every day, how many hours are you awake?

7. What cost 2 lbs. of cinnamon at 5 cents an ounce?

8. If 10 apples are sold for 5 cents, what is the price per dozen?

9. If a bushel of wheat costs \$1.20, how much is that per pound?

10. If a bushel of wheat weighs 60 pounds, what is the weight of a wagon-load of 40 bushels?

*Make up many other questions similar to the above.*

## SEAT WORK.

## Review.

Write answers to the following questions:

1. Albert has 36 acorns, Tom has 63, and Frank has 157. How many have all?

2. How many hours in 1 week? in 10 weeks? in 100 weeks? in 50 weeks? in 1 year?

3. How many gallons in 12 barrels? in 120 barrels? in 1200 barrels?

4. A room is 32 feet long and 25 wide. How many feet around is it?

5. How many inches around a pane of glass 10 in. by 14 in.?

6. What is the area of the same pane?

7. Write the squares of all the numbers from 12 to 20.

8. Commit to memory the squares written as above.

9. Multiply:

332	428	527
<u>12</u>	<u>13</u>	<u>14</u>

639	312	340
<u>15</u>	<u>16</u>	<u>17</u>

## CLASS WORK.

## Factoring.

(Review: Let no number exceed 100.)

1. What two numbers multiplied together make 84?

2. What prime numbers multiplied together make 84?

Then we say that the prime factors of 84 are — what?

3. Find now the prime factors of 68. Also of the following numbers: 40, 92, 16, 27, 56, 33, 48, 72, 64, 12, 36, 99, 78, 49, 35, etc.

4. What is the largest number that will divide both 12 and 16? 20 and 25? 35 and 42?

5. What is the smallest number that contains both 4 and 6? 5 and 10? 7 and 2? 8 and 4?

6. A plank is 12 feet long, 6 inches wide, and 1 inch thick, how many feet does it contain?

7. How many feet in 12 such planks? in 20 such planks?

8. At 3 cents a foot, what will 50 such planks cost?

9. How many such planks will floor a room 24 feet long and 16 feet wide?

## SEAT WORK.

1. Add the following:

93	12	31	22
24	135	27	131
52	62	116	263
26	513	22	17
12	414	54	12
71	211	17	52

52	21
36	176
11	25
52	188
39	37
65	29

2. Multiply:

1234 by 5.      412 by 61.

3. Find all the divisors of 35, 45, 55, 65, 75, 85, 95.

4. Find all the divisors of 18, 28, 38, 48, 58, 68, 78, 88, 98.

5. Draw a right angle.

6. Divide this right angle into 2 equal parts.

7. How many right angles in this figure:



8. Divide each right angle into two equal angles.



## CLASS WORK.

## Time.

1. How many seconds in 2 minutes? in 10 minutes? 20 minutes? 60 minutes?

2. How many minutes in 2 hours? in 12 hours? in 24 hours? in 1 day?

3. How many hours in 7 days? in 1 week? in 1 month?

4. How many minutes in  $\frac{1}{2}$  hour? in  $\frac{3}{4}$  hour?

5. How many hours in the month of January?

## Miscellaneous.

6. Mr. Jackson sold a horse for \$150, and by so doing gained \$24. What was the cost of the horse?

7. How much is  $\frac{1}{16}$  of 105? of 1050?

8. How many cents in  $\frac{1}{4}$  of a dollar? in  $\frac{3}{4}$  of a dollar?

9. What is the smallest number of pieces with which you can exactly pay for an 80-cent doll?

10. Mr. Thompson bought 27 gal. of milk. How many quarts did he buy?

## SEAT WORK.

1. Copy, and fill the blanks:

$$\frac{1}{2} \text{ of } 500 =$$

$$\frac{1}{2} \text{ of } 1500 =$$

$$\frac{1}{3} \text{ of } 100 =$$

$$\frac{1}{3} \text{ of } 600 =$$

$$\frac{2}{3} \text{ of } 600 =$$

$$(\frac{1}{3} \text{ of } 100) \times 15 =$$

$$\frac{1}{4} \text{ of } 1200 =$$

$$\frac{3}{4} \text{ of } 9000 =$$

$$\frac{1}{7} \text{ of } 840 =$$

$$\frac{4}{7} \text{ of } 840 =$$

$$\frac{1}{8} \text{ of } 144 = \frac{1}{4} \text{ of}$$

$$(\frac{1}{9} \text{ of } 81) + (\frac{1}{6} \text{ of } 96) =$$

2. Write the prime factors of 84, 125, 136, 169, 175, 196.

3. Make up five questions like those in the other column, and write the answers to them.

4. Review the multiplication table, so that you can repeat it with perfect readiness to  $12 \times 12 = 144$ .

5. Add these columns:

3	18	315
8	37	246
9	45	112
7	63	228
2	44	723
6	13	372
<u>3</u>	<u>27</u>	<u>411</u>

## CLASS WORK.

1. One-half of some number is 42. What is the number?

2. I have 90 bushels of wheat. How many sacks, each holding 2 bushels, will contain it all?

3. If you travel 10 miles an hour, how long will it take you to travel 100 miles? 1000 miles?

4. If a train runs at an average rate of 40 miles an hour, how far will it run in 24 hours?

5. In 384 eggs, how many dozens?

6. What is the cost of 5 Third Readers at 48 cents each, 3 copy-books at 10 cents each, and 5 lead-pencils at 5 cents each?

7. What is the cost of  $2\frac{1}{2}$  bushels of wheat at 80 cents a bushel?

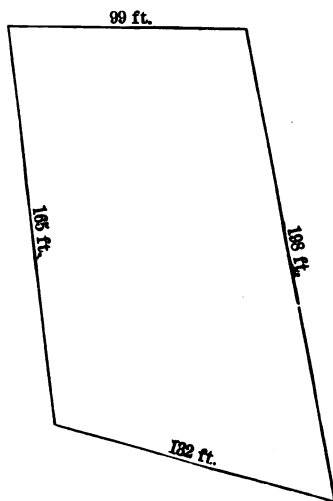
*Give the pupils much practical work in buying, selling, making bills, measuring, and weighing. Do not let a day pass without some work of this kind. Require the pupils to originate much of this work. Lead them to make discoveries of their own.*

## SEAT WORK.

1. Suppose you have 18 ten-cent pieces. Buy 4 lbs. lard at 9 cts., 2 qt. berries at 12 cts., and  $\frac{1}{2}$  lb. cheese at 36 cts. How much will you have left?

2. Buy 16 yards of muslin at 14 cts. a yard. Sell 4 yards at 20 cts. a yard, and the rest at 15 cts. How much do you gain?

3. If you buy a pint of milk every day for a year, how many gallons will you thus buy?



4. This diagram represents a garden. Find how many rods of fence will be required to enclose it.

## CLASS WORK.

## Practical Business.

1. Buy 3 dozen pencils at 20 cents a dozen, and sell them at 3 cents apiece. How much do you gain?

2. With what you have gained buy 2 dozen oranges. Sell them at 5 cents apiece. How much do you gain this time? and how much money have you altogether?

3. Now invest all your money in pass-books at 5 cents apiece. Sell them at 8 cents apiece. How much do you gain?

4. How much more money have you now than when you began business?

5. Buy 8 pocket knives at 25 cents each. Give a \$5 bill in payment. How much change should you receive?

6. Spend this change for chickens at 30 cents each. How many chickens do you buy?

7. Sell the chickens at 40 cents each, and the pocket knives at 20 cents each. How much do you gain by your trading?

*Continue with such exercises.*

## SEAT WORK.

$$(\frac{1}{2} \text{ of } 100) \times (\frac{1}{4} \text{ of } 100) =$$

$$(5 \times 20) \div (4 \times 5) =$$

$$(3 \times 15) \div (\frac{1}{2} \text{ of } 18) =$$

$$(6^2 - 11) \times 4 =$$

$$(8 \times 5) - 5^2 = 20 +$$

$$(7 \times 9) \div 3 = 7 \times$$

$$8^2 - 7^2 = 8 +$$

$$9^2 - 8^2 = 9 +$$

$$10^2 - 9^2 = 10 +$$

$$11^2 - 10^2 = 11 +$$

$$19^2 - 18^2 = 19 +$$

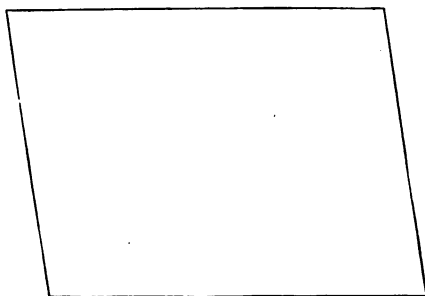
$$6^2 - 4^2 = 2 \times (6 + ) .$$

$$8^2 - 6^2 = 2 \times (8 + ) .$$

$$5^2 - 3^2 = 2 \times (5 + ) .$$

$$19^2 - 17^2 = 2 \times (19 + ) .$$

$$8^2 - 5^2 = 3 \times (8 + ) .$$



1. Divide this parallelogram into two equal triangles. Find the area of the parallelogram. Find the area of each triangle.

## CLASS WORK.

*Show the pupils how to divide when a figure of the dividend is not exactly divisible by the divisor; as,*

$$2316 \div 4 = ?$$

*But do not confuse the child's knowledge of the process, by requiring a too minute analysis.*

1. A farmer had 926 bushels of wheat. How many bags, each holding 2 bushels, would contain it all?

2. If 9 horses cost \$729, what is their average cost?

3. There are 320 rods in 1 mile. How many rods in  $\frac{1}{2}$  mile? How many in 4 miles?

4. A street is 1 mile long and 2 rods wide. What is its area in square rods?

5. There are 160 square rods in 1 acre. How many square rods in 4 acres?

6. How many acres in a field 16 rods long and 10 rods wide?

7. Give the length and width of another field of a different shape, but having the same area.

## SEAT WORK.

$56 \div 4 =$	$156 \div 4 =$
$456 \div 4 =$	$1256 \div 4 =$
$1656 \div 4 =$	$5256 \div 4 =$
$81 \div 9 =$	$981 \div 9 =$
$918 \div 9 =$	$459 \div 9 =$
$369 \div 9 =$	$2342 \div 2 =$
$1436 \div 2 =$	$2512 \div 2 =$
$1628 \div 2 =$	$1796 \div 2 =$
$1436 \div 4 =$	$2512 \div 4 =$
$1436 \div 8 =$	$2512 \div 8 =$
$1628 \div 4 =$	$2512 \div 10 =$
$1628 \div 8 =$	$2512 \div 12 =$

$$100 \times 12 =$$

$$232 \times 23 =$$

$$116 \times 46 =$$

$$242 \times 15 =$$

$$125 \times 12 =$$

$$236 \times 14 =$$

$$272 \times 30 =$$

$$72 \times 300 =$$

$$281 \times 2 =$$

$$327 \times 5 =$$

$$116 \times 92 =$$

$$69 \times 69 =$$

$$4 \overline{) 3324}$$

$$5 \overline{) 1620}$$

$$8 \overline{) 7280}$$

$$9 \overline{) 8145}$$

## CLASS WORK.

1. A room is 15 feet long and 12 feet wide. What is the area of its floor?

2. What is its area in square yards?

3. A room is 8 yd. long and 5 yd. wide. What is the area of its floor?

4. How many square yards of carpet would be required to cover the floor?

5. If it is 9 feet high, what is the area of one side? of both sides?

6. What is the area of one end? of both ends?

7. What is the area of the ceiling?

8. Measure this schoolroom, and give the area of floor, walls, and ceiling.

9. A farmer wishes to make a grain-box 8 ft. long, 5 ft. wide, and 4 ft. deep. How many square feet of plank will be required to make the bottom? How many to make the two ends? the two sides? the top, or lid? How many to make the entire box?

## SEAT WORK.

1. Here are some boxes. Measure them on the inside and find the capacity in cubic inches of each box.

*NOTE. The teacher should provide for this work at least one small square box for each pupil. The boxes, being of different sizes, may be passed from pupil to pupil. The boxes may be of paper or any other material.*

2. A box is 3 inches wide and 6 inches long. How many square inches of board will be required to make the top and bottom?

3. The same box is 4 inches deep. How many square inches of board will be required to make the two sides and the two ends? How many to make the entire box?

4. If you have a board 24 inches long and 6 inches wide, how will you cut the pieces for this box from it? How much waste will there be?

Try this by cutting a piece of paper or pasteboard just as you would cut the board.

## CLASS WORK.

## Review.

1. Draw a right triangle.
2. Draw two lines meeting at right angles, thus,



Make  $AB = 4$  inches.

$BC = 3$  inches.

3. Now draw a line from  $A$  to  $C$ . How long is  $AC$ ?

4. Square of  $AB = 4^2 =$

Square of  $BC = 3^2 =$

The sum of these  $=$

Square of  $AC = 5^2 =$

5. Draw right triangles of different sizes, and measure the sides.

We call the longer side, as  $AC$ , of a triangle the **Hypotenuse**.

Learn this: The square of the hypotenuse is equal to the sum of the squares on the other two sides.

6. Measure the length and width of your slate.

7. Measure the distance from *one corner* of your slate to the *opposite corner*.

## SEAT WORK.

## Review.

1. Here is a triangle cut from paper. Measure the sides.

2. Here is a sheet of paper 4 inches long and 3 inches wide. What is the distance from one corner to the opposite corner?

3. Write this:

*Right Triangle.*  
*Hypotenuse.*

4.  $40^2 =$   $30^2 =$

$40^2 + 30^2 =$

$50^2 =$

5. Copy, and fill the blanks:

$150 = 3 \times$

$\frac{1}{3}$  of  $150 =$

$\frac{1}{10}$  of  $150 =$

$150$  da. = mo.

$200$  da. = mo. da.

$\frac{1}{2}$  of  $1$  yr. = da.

$\frac{1}{4}$  of  $1$  yr. = da.

6.  $\frac{1}{10}$  of  $200 =$

$200$  qt. = gal.

$200$  bu. = pk.

7.  $12 \times$  =  $300$ .

$\frac{1}{12}$  of  $300 =$

$\times 30 = 300$ .

## CLASS WORK.

*Give some simple lessons in the process of long division. Do not let the divisor exceed 50.*

- (1)  $8 \div 8 =$
- (2)  $19 \div 8 =$
- (3)  $32 \div 8 =$
- (4)  $192 \div 8 =$
- (5)  $16 \div 16 =$
- (6)  $38 \div 16 =$
- (7)  $64 \div 16 =$
- (8)  $384 \div 16 =$
- (9)  $384 \div 32 =$
- (10)  $768 \div 32 =$
- (11)  $768 \div 64 =$
- (12)  $1536 \div 64 =$
- (13)  $19 \div 9 =$
- (14)  $18 \div 9 =$
- (15)  $198 \div 9 =$
- (16)  $1980 \div 9 =$
- (17)  $198 \div 18 =$
- (18)  $1980 \div 18 =$
- (19)  $3960 \div 36 =$
- (20)  $7956 \div 36 =$

*By a variety of examples like the above, lead up to the true process. Solve the examples in their order, and let each be understood before the next one is begun.*

## SEAT WORK.

- (1)  $9189 \div 9 =$
- (2)  $3627 \div 9 =$
- (3)  $7254 \div 18 =$
- (4)  $168 \div 8 =$
- (5)  $1344 \div 32 =$
- (6)  $384 \div 48 =$
- (7)  $2100 \div 42 =$
- (8)  $369 \div 41 =$
- (9)  $738 \div 41 =$
- (10)  $4608 \div 48 =$
- (11)  $9 \times 6 =$
- (12)  $54 \times 9 =$
- (13)  $54 \div 6 =$
- (14)  $234 \div 13 =$
- (15)  $234 \div 18 =$
- (16)  $13 \times 18 =$
- (17)  $34 \times 21 =$
- (18)  $714 \div 34 =$
- (19)  $714 \div 21 =$
- (20)  $8112 \div 26 =$
- (21)  $8112 \div 13 =$
- (22)  $26 \times \quad = 8112.$
- (23)  $13 \times \quad = 8112.$
- (24)  $40 \times 40 =$
- (25)  $1600 \div 40 =$
- (26)  $1640 \div 40 =$
- (27)  $1760 \div 40 =$
- (28)  $1728 \div 12 =$
- (29)  $144 \div 12 =$
- (30)  $1728 \div 144 =$

## CLASS WORK.

**Measuring Wood.**

1. A farmer has a pile of wood 8 feet long, 4 feet high, and 4 feet wide. How many cubic feet does it contain?

2. Such a quantity of wood is called a **Cord**.

Write and remember this :

128 cubic feet = 1 cord.

3. A wood-cutter has a pile of wood 24 feet long, 4 feet wide, and 4 feet high. How many cords are in the pile?

4. He has another pile 4 feet long, 4 feet wide, and 4 feet high. How many cords?

5. He has a third pile 20 feet long, 8 feet high, and 8 feet wide. How many cords?

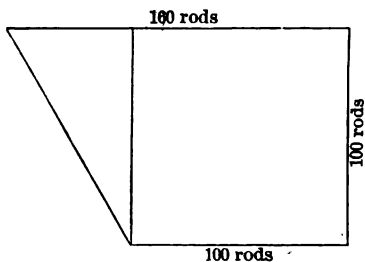
**Bills.**

1. Buy 7 yd. of calico at 9 cts. a yard, 17 yd. of silk at \$2 a yard, and  $37\frac{1}{2}$  yd. of cloth at \$2 a yard. Pay for it, and require the clerk to make a bill.

If you give 11 ten-dollar bills *in payment*, how much change *will you receive*?

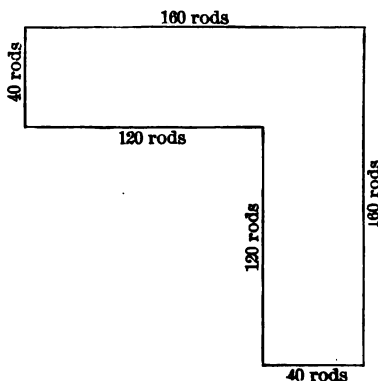
## SEAT WORK.

1. Here is a diagram of John Smith's farm. Find its area in perches or square rods.



*NOTE.* Find first the area of the square, then that of the triangle.

2. Here is a diagram of William Brown's farm. Find how many acres it contains.



3. Into how many square 10-acre fields can Mr. Brown divide his farm?



## CLASS WORK.

1. Name ten things that are sold by the pound.

The ounce and the pound, about which we have already learned, are called “ounce avoirdupois,” and “pound avoirdupois.” They are used in weighing coarse, heavy articles.

The smallest weight in common use is called a **Grain**. It is about as heavy as a dried grain of wheat. There are 7000 grains in 1 lb. avoirdupois, and  $437\frac{1}{2}$  grains in 1 oz. avoirdupois.

In weighing gold, silver, and precious stones, we use another kind of weight, known as troy weight. There are only 5760 grains in 1 lb. troy.

*If possible illustrate the above with the real balances and weights.*

2. A pound troy = 12 troy ounces. How many grains in 1 oz. troy?

Medicines and similar substances are weighed by what is called apothecary's weight.

Like the troy pound, the apothecary pound = 5760 grains, and is composed of 12 ounces.

## SEAT WORK.

1. Write the following :

Avoirdupois. Troy.

7000 gr. = 1 lb. avoirdupois.

5760 gr. = 1 lb. troy.

2. How much heavier is 1 lb. avoirdupois than 1 lb. troy?

3. How many ounces = 1 lb. avoirdupois?

4.  $\frac{1}{16}$  of 7000 =  $437\frac{1}{2}$ . How many grains in 1 lb. avoirdupois? in 1 oz. avoirdupois?

5. What is  $\frac{1}{16}$  of 5760?

6. Write this :

1 oz. avoirdupois =  $437\frac{1}{2}$  gr.

1 oz. troy = 480 gr.

7. Which is heavier, an ounce troy or an ounce avoirdupois? How much?

8. Write this, and commit to memory :

**Troy Weight.**

24 grains = 1 pennyweight

20 pennyweights

= 1 ounce.

12 ounces = 1 pound.

**Apothecary's Weight.**

20 grains = 1 scruple.

3 scruples = 1 dram.

8 drams = 1 ounce.

12 ounces = 1 pound.

## CLASS WORK.

## Weighing.

1. Which is heavier, a pound avoirdupois or a pound troy? How much?

2. Which is heavier, an ounce avoirdupois or an ounce troy? How much?

3. If you buy a pound of butter by troy weight, and pay for it as a pound avoirdupois, do you gain or lose?

4. I buy an ounce of quinine for 60 cents; but the shopkeeper having only avoirdupois scales, gives me an ounce avoirdupois. Do I get too much or too little?

5. How many ounces avoirdupois in 25 lbs.?

6. How many grains in 1 avoirdupois pound? in 12 avoirdupois pounds?

7. How many ounces in 5 lbs. of butter? in 5 lbs. of gold? How many grains?

8. At \$18 an ounce, what is the value of 1 lb. of gold?

9. How many ounces in 1 lb. troy? in 12 lbs. troy?

*Give much practical work.*

## SEAT WORK.

1. How many grains in  $\frac{1}{2}$  oz. troy?

2. How many grains in  $\frac{1}{2}$  pennyweight?

3. Make a list of things sold by troy weight.

4. Make a list of things sold by apothecary's weight.

5. Copy, and fill the blanks:  
7000 — 5760 =

$$16 \overline{)7000} \qquad 12 \overline{)5760}$$

$$480 - 437\frac{1}{2} = \qquad 16 \times 16 =$$

$$72 \text{ gr.} = \text{pwt.}$$

$$240 \text{ pwt.} = \text{oz.}$$

$$240 \text{ pwt.} = \text{lb. troy.}$$

6. Write these words:

Avoirdupois.

Apothecary.

Troy.

7. Write the names of articles weighed by apothecary's weight; of articles weighed by troy weight; of articles weighed by avoirdupois weight.

$$8. \quad 1 \text{ avoird. lb.} = \text{oz.}$$

$$1 \text{ avoird. lb.} = \text{gr.}$$

$$1 \text{ apoth. lb.} = \text{oz.}$$

$$1 \text{ apoth. lb.} = \text{gr.}$$

## CLASS WORK.

## Purchases.

1. Buy 9 yards of calico at 8 cents a yard, 41 yards of silk at \$3 a yard, and 40 yards of muslin at  $37\frac{1}{2}$  cents a yard.

Pay for these articles, and receive correct change.

2. Buy 26 gallons 3 quarts of milk at 2 cents a pint. Pay for it, and receive change.

3. Buy ten articles at a bookstore. The clerk is to make a bill. Pay the bill and receive change.

4. Buy ten articles of a farmer. The farmer is to make a bill. Pay the bill.

5. Buy 100 feet of clothes-line at 3 cents a yard.

6. Buy 100 feet of clothes-line at 3 cents a foot.

7. Buy  $16\frac{1}{2}$  bushels of potatoes at 40 cents a peck.

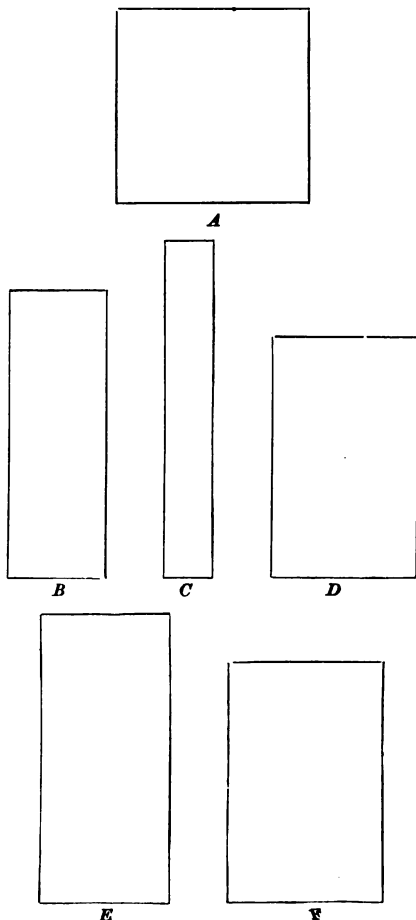
8. Buy 100 bushels of wheat at 65 cents a bushel.

9. Buy 2 dozen apples at the rate of 3 apples for 5 cents.

10. Buy a dozen oranges at 5 cts. apiece, and 2 dozen lemons at the rate of 6 for 10 cts.

## SEAT WORK.

1. Find the distance around the edge of each of these rectangles, supposing  $\frac{1}{4}$  inch to represent 1 yard. Find the area of each.



## CLASS WORK.

## Review of Dry Measure.

1. How many pecks in 1 bu.?  
in 10 bu.? in 100 bu.?

2. How many quarts in 1  
pk.? in 1 bu.?

3. If 1 quart of hazel-nuts  
sells for 5 cents, what is the  
value, at the same rate, of 1  
bushel? of 12 bushels?

4. How many quarts of beans  
can be put into a half-bushel  
measure?

5. If 1 peck of potatoes cost  
40 cents, what will 15 bushels  
cost at the same rate?

*Make up many other questions  
similar to the above.*

6. A barrel of flour weighs  
196 lbs. What is the weight of  
 $\frac{1}{2}$  barrel? of  $\frac{1}{4}$  barrel?

7. If a barrel of flour cost  
\$6, what is the cost of a bag of  
flour weighing 49 lbs.?

8. If wheat sells at \$1 a  
bushel, and 4 bushels make 1  
barrel of flour, how much is  
gained by grinding the wheat  
into flour at \$6 a barrel?

9. What else is made from  
*the wheat besides flour?*

## SEAT WORK.

1. Copy, and fill the blanks

4 pk. = bu.

pk. = 40 bu.

pk. = 120 bu.

qt. = 1 pk.

4 qt. = bu.

1 bu. = pk.

1 bu. = qt.

$\frac{1}{2}$  bu. = pk.

$\frac{1}{2}$  bu. = qt.

$4 \times 40 =$

$15 \times 160 =$

2. Copy :

*Pint; Quart; Peck;  
Bushel.*

*Dry Measure.*

*2 pt. = 1 qt.*

*8 qt. = 1 pk.*

*4 pk. = 1 bu.*

196 lbs. flour = 1 barrel.

$\frac{1}{2}$  barrel of flour = lbs.

$\frac{1}{4}$  barrel of flour = lbs.

$\frac{1}{8}$  barrel of flour = lbs.

4 bu. of wheat weighs lbs.

1 bbl. of flour weighs lbs.

## CLASS WORK.

## Review of Liquid Measure.

1. How many gallons in 1 barrel? How many quarts? How many pints?

2. How many gallons in 1 hogshead? How many quarts? How many pints?

3. How many gallons in 10 hogsheads? in 20 barrels?

4. A cistern holds 200 barrels of water. How many times will this water fill a quart pail?

5. A milkman sells 63 quarts of milk daily. How many quarts does he sell in a month of 30 days? How many barrels?

*Make up many other questions similar to these.*

6. A box which measures on the inside 11 inches long, 3 inches wide, and 7 inches deep, contains how many cubic inches?

7. Such a box will contain 1 liquid gallon. One liquid gallon, then, is equal to how many cubic inches?

8. There are 231 cubic inches in a liquid gallon. Write this:  
 $231 \text{ cu. inches} = 1 \text{ liq. gal.}$

## SEAT WORK.

1. Copy, and fill the blanks:

$$1 \text{ bbl.} = \text{gal.}$$

$$1 \text{ bbl.} = \text{qt.}$$

$$1 \text{ bbl.} = \text{pt.}$$

$$1 \text{ hhd.} = \text{gal.}$$

$$1 \text{ hhd.} = \text{bbl.}$$

$$1 \text{ hhd.} = \text{pt.}$$

$$10 \text{ hhd.} = \text{gal.}$$

$$10 \text{ hhd.} = \text{pt.}$$

$$20 \text{ bbl.} = \text{gal.}$$

$$200 \times 31\frac{1}{2} =$$

$$200 \text{ bbl.} = \text{gal.}$$

$$200 \text{ bbl.} = \text{qt.}$$

$$200 \text{ bbl.} = \text{pt.}$$

$$\frac{1}{2} \text{ bbl.} = \text{gal.}$$

$$\frac{1}{2} \text{ bbl.} = \text{qt.}$$

$$30 \times 63 =$$

$$63 \text{ qt.} = \text{bbl.}$$

2. Copy this:

*One Liquid Gallon*

*= 231 Cubic Inches.*

3. Copy, and fill the blanks:

$$\frac{1}{4} \text{ of } 1 \text{ gal.} = \text{cu. in.}$$

$$\frac{1}{2} \text{ of } 1 \text{ gal.} = \text{cu. in.}$$

$$\frac{1}{16} \text{ of } 1 \text{ gal.} = \text{cu. in.}$$

$$1 \text{ quart} = \frac{1}{4} \text{ gallon.}$$

$$1 \text{ quart} = \text{cu. in.}$$

$$1 \text{ pint} = \text{cu. in.}$$

## CLASS WORK.

## Review of Long Measure.

1. Measure the length and width of your desks. Give result in inches.

2. Measure the length and width of the schoolroom. Give result in feet; in yards; in inches.

3. Measure the length and width of the school-yard. Give result in yards; in feet; in rods.

4. Measure the distance to the post-office (or some other prominent place). Give result in rods.

5. Measure  $\frac{1}{2}$  mile along the street or road; measure  $\frac{1}{4}$  mile.

6. How many rods in a mile? How many feet in a rod?

7. How many feet in a mile? in  $\frac{1}{2}$  mile? in  $\frac{1}{4}$  mile?

8. In 25,000 feet how many miles?

9. How many yards in a mile?

10. How many rods of fence will be required to enclose a farm which contains 80 acres, and is  $\frac{1}{2}$  mile long?

## SEAT WORK.

1. Copy, and fill the blanks:

inches = 1 foot.

feet = 1 yard.

feet = 1 rod.

yards = 1 rod.

feet = 1 mile.

yards = 1 mile.

rods = 1 mile.

$\frac{1}{2}$  mile = rods.

$\frac{1}{4}$  mile = rods.

100 yards = feet.

40 rods = feet.

1 mile = feet.

5 miles = feet.

10 rods = feet.

40 rods = feet.

160 rods = feet.

320 rods = feet.

$16\frac{1}{2}$  feet =

2 rods = feet.

4 rods = feet.

feet = 1 chain.

2 chains = feet.

10 chains = feet.

chains = 1 mile.

chains =  $\frac{1}{2}$  mile.

## CLASS WORK.

## Review of Square Measure.

1. Mr. Smith has 4 fields. The first field is square and measures just 80 rods on each side. How many rods of fence will be required to enclose it?

2. The second field is 120 rods long and 40 rods wide. The third is 140 rods long and 20 rods wide. The fourth is 100 rods long and 60 rods wide. How many rods of fence will be required to enclose each field?

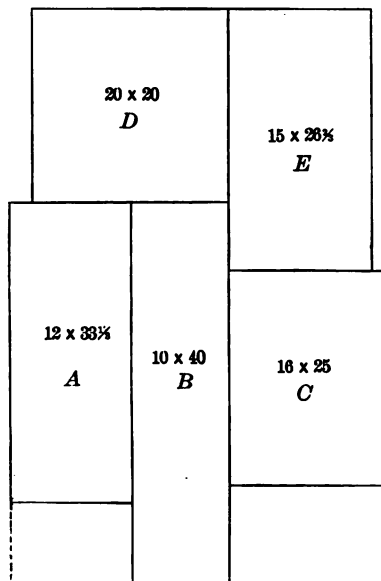
3. Find the number of acres contained in each of Mr. Smith's fields.

4. Mr. Brown also has four fields. The first field is square, and measures just 40 rods on each side. The second field is 80 rods long and 20 rods wide. The third field is 100 rods long and 16 rods wide; and the fourth field is 400 rods long and 4 rods wide. How many acres does each of these fields contain?

5. How many rods of fence will be required to enclose each? How many to enclose the whole farm?

## SEAT WORK.

1. This diagram represents the rooms in Mr. Robinson's house:



2. Find the area of the floor of each room.

3. The walls are 10 feet high. Find how many square yards of plastering will be required for the walls of each room, making no allowance for doors or windows.

4. Which is the largest room? Which required the least material for its construction?

## CLASS WORK.

**Cubic Measure, Liquid Measure,  
Dry Measure.**

1. How large a box will contain exactly one liquid gallon?

2. A box which on the inside is 4 inches wide, 11 inches long, and  $6\frac{1}{4}$  inches deep, will hold nearly one dry gallon.

$$4 \times 11 \times 6\frac{1}{4} = 268.$$

3. One dry gallon =  $268\frac{1}{2}$  cubic inches, and very little more.

4. How many more cubic inches in a dry gallon than in a liquid gallon?

5. Do you measure strawberries by dry measure or by liquid measure?

6. If you buy a gallon of strawberries, and have them measured in a liquid gallon measure, do you get too many berries or too few? By how much?

7. About how many cubic inches in a dry quart? How many cubic inches in a liquid quart? How many more cubic inches in a dry quart than in a liquid quart?

## SEAT WORK.

1. Write this, and fill the blanks :

$$1 \text{ liq. gal.} = 231 \text{ cu. in.}$$

1 dry gal. =  $268\frac{1}{2}$  cu. in. and a little more.

$$8 \text{ liq. gal.} = \quad \text{cu. in.}$$

8 dry gal. = 2150 cu. in. and a little more.

4 pecks = \quad cu. in. and a little more.

$$1 \text{ bu.} = 2150\frac{1}{2} \text{ cu. in.}$$

$$1 \text{ bu.} = \quad \text{cu. in.}$$

$$8 \text{ liq. gal.} = \quad \text{cu. in.}$$

$$\text{Difference} = \quad \text{cu. in.}$$

2. How many cubic inches in a box 10 inches square and  $21\frac{1}{2}$  inches deep? How many bushels will it hold?

3. Write a list of 10 things which should be measured by dry measure.

4. Write a list of six things which should be measured by liquid measure.

5. Write the table of liquid measure.

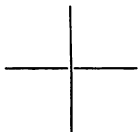
6. Write the table of dry measure.



## CLASS WORK.

## Angles.

1. Angles are divided into degrees. Draw two lines crossing each other at right angles, thus :



2. How many angles have you formed with these two lines? Is there any difference in the size of the angles?

3. Around any given point—as, for example, the point where these two lines meet—there are 360 degrees. If there are 360 degrees in the four equal angles about this point, how many degrees are there in each angle?

4. How many lines would you have to draw, crossing each other in a similar way, to make 6 equal angles? How many degrees would there be in each angle?

5. Draw lines so as to form 10 equal angles. How many degrees in each angle?

## SEAT WORK.

## Angles.

1. Draw a right-angled triangle.

2. Draw a square whose area is twice as great.

3. Draw a rectangle whose area is the same as that of the triangle.

4. Draw a rhomboid having also the same area.

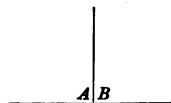
5. Draw a square inch.

6. Divide it into 16 equal squares.

7. Divide it into 32 equal triangles.

8. How many degrees in a right angle? How many degrees in half a right angle?

9. Draw two right angles together, thus :



We say such angles are adjacent angles. Write this word :

*Adjacent.*

10. How many degrees in angle *A*? in angle *B*? in both together?

## CLASS WORK.

1. Draw a line 10 inches long. Draw a second line  $\frac{1}{10}$  as long. What is the combined length of the two lines? Write it in figures.

2. In the number 11, as you have written it, how many inches does the right-hand figure represent? How many does the left-hand figure represent?

3. A figure in the first order, or units' place, represents only  $\frac{1}{10}$  as much as the same figure in the second order.

4. See if this is true with the number 22; 55; 99.

5. You have drawn a line 10 inches long, also one 1 inch long. Draw now a third line  $\frac{1}{10}$  as long as the second line. How long is it? What is the combined length of the three lines? Write it in figures.

6. It may be written thus:  $11\frac{1}{10}$  inches. But there is another way, and that is by making another order, or place, to the right of the units' order, *and calling it the order or place of tenths, thus, 11.1.*

## SEAT WORK.

1. Copy, and fill all blanks:

$$\frac{1}{10} \text{ of } 10 =$$

$$10 + \frac{1}{10} \text{ of } 10 =$$

$$20 + \frac{1}{10} \text{ of } 20 =$$

$$30 + \frac{1}{10} \text{ of } 30 =$$

$$40 + \frac{1}{10} \text{ of } 40 =$$

$$50 + \frac{1}{10} \text{ of } 50 =$$

$$60 + \frac{1}{10} \text{ of } 60 =$$

$$70 + \frac{1}{10} \text{ of } 70 =$$

$$100 + \frac{1}{10} \text{ of } 100 =$$

$$10 + \frac{2}{10} \text{ of } 10 =$$

$$40 + \frac{2}{10} \text{ of } 10 =$$

$$100 + \frac{2}{10} \text{ of } 10 =$$

$$10 + \frac{7}{10} \text{ of } 10 =$$

$$40 + \frac{9}{10} \text{ of } 10 =$$

$$100 + \frac{6}{10} \text{ of } 10 =$$

$$\frac{1}{10} \text{ of } 1 =$$

$$11\frac{1}{10} = 11.1.$$

$$21\frac{1}{10} =$$

$$22\frac{2}{10} =$$

$$33\frac{1}{10} =$$

$$33\frac{2}{10} =$$

$$50\frac{1}{10} =$$

$$55\frac{5}{10} =$$

$$6.3 = 6\frac{3}{10}.$$

$$9.9 = 9\frac{9}{10}.$$

$$18.8 =$$

## CLASS WORK.

1. Write the number twenty-two and two-tenths in two ways:

$22\frac{2}{10}$           22.2

2. We will talk about the second method of writing this number. Which figure is in the units' place? What does it represent?

3. Which figure is in the tens' place? What does it represent?

4. What do you call the place in which the other figure stands? What does it represent?

5. A period is written between the place of the units and the place of the tenths, so that there may be no mistake as to which is the units. We call this period the **Decimal Point**. The word *decimal* means tenth.

6. Write as one number twenty-two dollars twenty-two cents.

7. Here the decimal point is written between the dollars and cents. Why? What does the 2 in the units' place represent? in the tenths' place?

## SEAT WORK.

1. Write, using the decimal point:

$22\frac{2}{10}$	$66\frac{8}{10}$
$22\frac{1}{10}$	$92\frac{3}{10}$
$22\frac{6}{10}$	$87\frac{7}{10}$
$39\frac{2}{10}$	$69\frac{8}{10}$
$43\frac{3}{10}$	$77\frac{7}{10}$
$54\frac{4}{10}$	$\frac{1}{10}$

2. Add dollars and cents, as below:

$\$22.37$   
 11.08  
 15.16  
 31.13  
 17.91  
62.33

3. Write, using the decimal point:

$23\frac{1}{10}$  feet.  
 $47\frac{3}{10}$  feet.  
 $54\frac{8}{10}$  feet.  
 $14\frac{2}{10}$  feet.

4. Add  $31.1$  feet.  
 $38.8$  feet.  
 $16.3$  feet.  
 $13.4$  feet.  
 $12.9$  feet.

## CLASS WORK.

1. Write again

\$22.22

The 2 in the cents' place represents one-tenth as much money as the 2 in the dimes' place. It represents one-hundredth as much money as the 2 in the dollars' place. See if this is not true.

2. Write  $88\frac{8}{10}$ , using the decimal point. 88.8

3. As we already know, the 8 in the tenths' place represents one-tenth as much as the 8 in the units' place. Suppose we write another 8 to the right, thus: 88.88

What is the value of the 8 thus written?

4. It is one-tenth of the value of 8 in the tenths' place. It is one-hundredth the value of the 8 in the units' place. Hence we call it 8-hundredths.

5. Read the number 88.88.

6. Write several other numbers with two figures at the *right of the decimal point*.

## SEAT WORK.

1. Copy, and fill the blanks:

 $\frac{1}{10}$  of 200 = $\frac{1}{10}$  of 20 = $\frac{1}{10}$  of  $\frac{1}{10}$  of 200 = $\frac{1}{100}$  of 200 = $\frac{1}{100}$  of 100 = $\frac{3}{100}$  of 100 = $\frac{5}{100}$  of 100 = $\frac{15}{100}$  of 100 = $\frac{1}{100}$  of 900 = $\frac{8}{100}$  of 900 = $\frac{5}{100}$  of 900 = $\frac{15}{100}$  of 900 =

2. Write the following, using the decimal point:

216 $\frac{1}{10}$ 312 $\frac{3}{10}$ 36 $\frac{33}{100}$ 197 $\frac{17}{100}$ 45 $\frac{12}{100}$ 413 $\frac{18}{100}$ 55 $\frac{55}{100}$ 163 $\frac{63}{100}$ 59 $\frac{95}{100}$ 128 $\frac{21}{100}$ 35 $\frac{93}{100}$ 139 $\frac{12}{100}$ 158 $\frac{75}{100}$ 649 $\frac{19}{100}$ 193 $\frac{93}{100}$ 444 $\frac{44}{100}$ 965 $\frac{65}{100}$ 638 $\frac{88}{100}$ 477 $\frac{37}{100}$ 312 $\frac{9}{100}$ 48 $\frac{11}{100}$ 31 $\frac{29}{100}$ 48 $\frac{48}{100}$ 232 $\frac{3}{100}$ 484 $\frac{4}{100}$ 23 $\frac{28}{100}$

CLASS WORK.

1. Draw a line  $\frac{1}{10}$  of a rod in length. Draw a line  $\frac{1}{100}$  of a rod in length.

2. How many feet in  $\frac{1}{100}$  of a mile? in  $\frac{1}{10}$  of a mile?

3. How many pounds in a ton? in  $\frac{1}{10}$  of a ton? in  $\frac{1}{100}$  of a ton? in  $\frac{1}{1000}$  of a ton?

4. A man owned 400 acres of land and sold  $\frac{1}{100}$  of it all. How many acres had he left? How many did he sell?

5. How many acres in a square mile? How many in  $\frac{1}{10}$  of a square mile? in  $\frac{1}{100}$ ?

6. Write the following, using the decimal point:

312 $\frac{15}{100}$  acres.

516 $\frac{25}{100}$  acres.

642 $\frac{6}{100}$  acres.

7. The above numbers represent the size of Mr. Bird's three farms. How many acres did he own all together?

8. He sold from the largest farm 412.6 acres. How many acres had he left?

9. He then divided the smallest farm into 3 equal fields. How many acres were in each?

SEAT WORK.

1. Copy, and fill the blanks:

$\frac{1}{10}$  of 360 =

$\frac{1}{100}$  of 360 =

.1 of 360 =

. of 360 = 3 $\frac{60}{100}$ .

. of 360 = 3.60.

$\frac{60}{100}$  = tenths.

$\frac{1}{100}$  of 6800 =

$\frac{1}{10}$  of 6800 =

$\frac{2}{100}$  of 6800 =

2. Write, using the decimal point:

$\frac{1}{10}$ ,  $\frac{5}{10}$ ,  $\frac{7}{10}$ ,  $\frac{2}{10}$ ,  $1\frac{3}{10}$ .

$\frac{11}{100}$ ,  $\frac{15}{100}$ ,  $\frac{27}{100}$ ,  $\frac{39}{100}$ ,  $\frac{50}{100}$ .

3. Write, using the decimal point, and then add:

395 $\frac{16}{100}$ .

712 $\frac{14}{100}$ .

84 $\frac{27}{100}$ .

812 $\frac{43}{100}$ .

4. Write, using the decimal point:

816 $\frac{77}{100}$ .

412 $\frac{9}{100}$ .

Subtract the lower number from the upper.

5.  $8 \times \frac{12}{100} =$

$8 \times .12 =$

## CLASS WORK.

1. Albert had \$100, but lost \$1. What part of his money did he lose?

2. If he had lost \$3, what part of his money would he have lost? What if he had lost \$6? \$16?

3. Mr. Clay had 700 sheep, but the dogs killed .04 of his flock. How many were killed?

4. In speaking of hundredths it is very common to say *per cent.* instead of hundredths,—which means the same. Hence, we might say that 4 per cent. of Mr. Clay's sheep were killed. What is 4 per cent. of 700?

5. William has 200 marbles. He sells 10 per cent. of them. How many hundredths of his marbles did he sell? How many marbles did he sell?

6. One dollar is what part of \$100? One dollar is what per cent. of \$100?

7. Albert had \$100 and lost \$3 of it. What per cent. did he lose? If he had lost \$50 of it, *what per cent.* would that have been?

## SEAT WORK.

1 is what part of 100?

3 is what part of 100?

50 is what part of 100?

$$\frac{1}{100} \text{ of } 700 =$$

$$.01 \text{ of } 700 =$$

$$.04 \text{ of } 700 =$$

$$.50 \text{ of } 700 =$$

$$.30 \text{ of } 700 =$$

$$\frac{1}{100} \text{ of } 1500 =$$

$$.04 \text{ of } 1500 =$$

$$\frac{1}{100} \text{ of } 200 =$$

$$\frac{50}{100} \text{ of } 200 =$$

$$\frac{75}{100} \text{ of } 200 =$$

$$\frac{96}{100} \text{ of } 200 =$$

$$.96 \text{ of } 200 =$$

$$.75 \text{ of } 200 =$$

$$1 \text{ per cent. of } 700 =$$

$$4 \text{ per cent. of } 700 =$$

$$50 \text{ per cent. of } 700 =$$

$$30 \text{ per cent. of } 700 =$$

$$4 \text{ per cent. of } 1500 =$$

$$50 \text{ per cent. of } 200 =$$

$$75 \text{ per cent. of } 200 =$$

$$96 \text{ per cent. of } 200 =$$

$$.20 \text{ of } 600 =$$

$$20 \text{ per cent. of } 600 =$$

$$.25 \text{ of } 600 =$$

$$25 \text{ per cent. of } 600 =$$

$$50 \text{ per cent. of } 600 =$$

## CLASS WORK.

1.  $\frac{50}{100}$  of any number equals what part of it? Show that you are right.

2. 50 per cent. of any number, then, = what part of it?  
25 per cent. = what part?

3.  $\frac{1}{4}$  of a number = what per cent. of it?

4. 20 per cent. of a number = what part of it?

5.  $\frac{1}{4}$  of 500 =

$\frac{1}{4}$  of 600 =

$\frac{1}{4}$  of 200 =

20 per cent. of 500 =

20 per cent. of 600 =

20 per cent. of 200 =

6.  $\frac{1}{4}$  of 50 =

$\frac{1}{4}$  of 20 =

$\frac{1}{4}$  of 80 =

20 per cent. of 50 =

20 per cent. of 20 =

20 per cent. of 80 =

20 per cent. of 25 =

20 per cent. of 125 =

*Continue such exercises.*

7.  $\frac{1}{10}$  = what per cent.?

$\frac{1}{25}$  = what per cent.?

$\frac{1}{20}$  = what per cent.?

$\frac{1}{10}$  = what per cent.?

$\frac{1}{4}$  = what per cent.?

## SEAT WORK.

1. Divide:

4000 by 10.

4000 by 100.

4000 by 1000.

4500 by 10.

4500 by 100.

4500 by 1000.

4560 by 10.

4560 by 100.

4560 by 1000.

4567 by 10.

4567 by 100.

4567 by 1000.

2. Notice the difference in the following numbers. Write them in words:

8765.

876.5

87.65

8.765

3. What part of the first number is the second? the third? the fourth?

4. What per cent. of the first number is the third?

5. Write an easy way of dividing any number by 10.

6. Find 5 per cent. of 240; of 24.

\$325.00	Columbus, Ohio July 5 1891
Sixty days after date I promise to pay to	
the order of John Johnson	
Three hundred and Twenty-five	00 Dollars
10/10	Robert J. Cannon.

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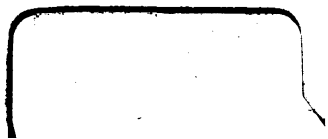
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